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NEW KANSAS FUNGI.

By J. B. Ellis and Elam Bartholomew.

The following thirty-two species of new fungi, with the exception of the first one on the list, were found by the junior author in Rooks County, Kansas, and the fact that he has found 130 additional new species in the same locality, leads to the conclusion that this region, which is situated midway between the Missouri River on the east and the Rocky Mountains on the west, at an altitude of 2000 feet above the sea, is unusually rich in many species, apparently rare, or not indigenous to other parts of the country.

Polyporus Kansensis. On the base of a rotten stump, Louisville, Pottawatomie Co., Kan., Oct., 1893 (No 1177).

Pileus orbicular, convexo-convex including the hymenium, 10 cm. across, light brown, minutely appressed-squamulose, margin thin and acute. Stipe 10-12 cm. high, 2 cm. thick, colored like the pileus or a little lighter; glabrous or nearly so, ½ its length brownish,—black below, subequal or sub-attenuated above. Flesh of the pileus and stipe milk white, firm, suberose-carnose. Pores of medium size, (⅓ mm. diam., 2–2½ mm. long) round or subangular, margin even, granulose-tomentose, decurrent. Spores white, elliptical, 6–8x5μ, on stout, cylindrical basidia 6–8μ thick. This is one of our finest North American species.

Puccinia Kansensis. On leaves of *Buchloë dactyloides*, Sept. 18, 1894 (No. 1577).

II and III. Sori amphigenous or mostly epiphyllous, sparsely scattered, very small, sublinear to linear by confluence. Uredosori soon appearing through the ruptured epidermis which falls away leaving the spore-mass mostly superficial. Uredospores subglobose or ovate, 16–20x14-16μ, epispore smooth but irregular, thick (about 2–3μ) hyaline; nucleus consisting of coarse, bright golden-yellow, granular matter. Teleutosori almost wholly superficial. Teleutospores bright yellowish-brown, short-elliptical, rounded,

Erythea, Vol. IV., No. 1 [2 January, 1896].

slightly constricted, nearly equal, lower cell sometimes wedge-shaped, not thickened at the apex, 25–30x15–18μ. Pedicels hyaline, short, weak and shriveled, inclining to fall away. Differs from *Puccinia Buchloes*, Schof., on the same host, in its smaller teleutospores, not thickened at the apex and in its weak, shriveled, hyaline pedicels.

Puccinia jubata. On culms and sheaths of *Hordeum jubatum*, Mch. 7, 1895 (No. 1680).

III. Sori oblong or linear, soon erumpent and naked 1-10 mm. long, ½–¾ mm. wide, often confluent, black Teleutospores clavate-oblong, only slightly constricted, 27–65x13–20μ, upper cell darker, obtusely rounded at the apex, or even truncate but mostly with an obtusely pointed papilla, direct or oblique, lower cell paler and mostly gradually narrowed into the stout, persistent, colored pedicel 40–70μ long. A few uredospores were seen, 18–22x14–16μ, faintly aculeate, yellowish-brown.

Differs from *P. graminis* in its thinner epispore and from *P. omnivora*, E. & E., in its larger spores.

Puccinia sparganioidis. On *Carex sparganioides*, Rooks Co., Kansas, Aug., 1895 (Bartholomew, No. 1908).

II and III. Amphigenous. Uredosori, very narrow, orange-yellow, about 1 mm. long, at first covered by the epidermis, then naked. Uredospores obovate or pyriform, orange-yellow, aculeate, stipitate, 22–35x14–20μ. Teleutosori small, elliptical, oblong or linear, 1–1½ (exceptionally 2–2½) mm. long, soon naked, nearly black. Teleutospores oblong-elliptical or oblong-clavate, very slightly constricted, 35–55 x15–20μ, rounded, or oftener obtusely pointed above, mostly narrowed below into the stout, persistent, 40–50μ long, subequal, hyaline pedicel. Epispore smooth, distinctly thickened above.

Differs from *P. ludibunda*, E. & E. (on the same host) in its smaller sori and broader teleutospores. The uredospores also, in *P. ludibunda* are decidedly smaller (16–22x12–15μ), and not as distinctly aculeate.

Puccinia Triodiae. On *Triodia purpurea*, Rooks Co., Kansas, Aug., 1895 (Bartholomew, No. 1897).

II and III. Amphigenous. Sori elliptical or oblong, ½–2 mm. long, soon naked, subpulvinate, nearly black. Uredospores mixed with the teleutospores, subglobose, 18–22μ, hyaline with a thick, subechinulate epispore at first, then yellow-brown and nearly smooth. Teleutospores elliptical or slightly obovate, scarcely constricted, yellow-brown, 22–30x19–22μ; epispore smooth, distinctly thickened at the rounded apex. Pedicels stout, persistent, sometimes oblique, yellowish, 80–90μ long.

Closely allied to *P. Windsoriae*, Schw., but that has teleutospores distinctly obovate and pedicels much shorter.

Cenangella thujina. On exposed wood of White Cedar post (*Thuja occidentalis?*) Feb., 1894 (No. 1382).

Gregarious or thickly scattered, patelliform, black, subcoriaceous, ½–¾ mm. diam., the opposite sides rolled together when dry so as to resemble a *Hysterium*. Asci oblong-pyriform, sessile, 40–20μ, paraphyses united above in a thin blue-black epithecium. Sporidia crowded, obovate, hyaline, uniseptate, strongly constricted at the septum, 14–16x7–8μ, the cells elliptical.

Stictis fusca. On dead branches of *Symphoricarpos occidentalis*, Feb., 1894 (No. 1366).

Immersed, urceolate, orbicular, ½–¾ mm. diam., excipulum and hymenium olive-black (horn-color within). The white-pruinose, erumpent margin constricted and nearly closed at first, but soon with a small round opening exposing the nearly black inner surface of the excipulum. Asci cylindrical, 180–200x5–6μ, 8-spored. Paraphyses filiform, 1–1¼μ thick, more or less branched above, but scarcely thickened. Sporidia filiform, nucleate, nearly as long as the asci, 1½μ thick.

Stictis Stigma C. & E. has the dark hymenium but lacks the prominent white margin. *S. radiata* and *S. stellata* which have the same habit differ in their stellate margin. This comes near *S. atro-alba*, Phil. & Plow., which, however, has asci only 90μ long. Very common. Found also on *Symphoricarpos vulgaris*.

Phoma viridis. On dead branches of *Fraxinus viridis*, Jan. 2, 1895 (No. 1636)

Perithecia evenly but thickly scattered or subaggregated, subepidermal but finally more or less exposed by the falling away of the epidermis, depressed-hemispherical, ⅓–½ mm. diam., papillate. Sporules short-elliptical, smoky-hyaline, obtuse, 4–5½x3½–4μ.

Approaches *Dothiorella*.

Phoma Ribis. On decorticated twigs of cultivated gooseberry, Mch. 1, 1895 (No. 1668).

Perithecia erumpent-superficial, scattered, globose or subconic-globose, black, 110–135μ diam., with a papilliform ostiolum. Sporules minute, oblong-elliptical, 3–4x1¼–1½μ on short (8-10x2-2½μ) basidia often branched at the base. Evidently the spermogonia of some *Diaporthe*.

Differs from *Phoma Ribesia*, Sacc. and *Phoma Grossulariae*, Schulz., in its smaller perithecia and sporules.

Aposphaeria Amaranti. On dead stems of *Amarantus retroflexus* (No. 1730).

Perithecia gregarious, superficial, globose or subovate-globose, soon depressed above or partially collapsing, about ⅓ mm. diam., covered at first with a thin, brown, granulose-tomentose coat which soon disappears, leaving the perithecium black. Ostiolum papilliform, soon perforated. Sporules ovate-elliptical or subglobose, yellowish-hyaline, with a single large nucleus nearly filling the cavity, 12–15x10μ.

(To be Concluded)

PRESIDENTIAL ADDRESS TO THE BOTANICAL SECTION OF THE BRITISH ASSOCIATION.

By W. T. Thiselton-Dyer, M. A., F. R. S.
Director of the Royal Gardens, Kew.

(Concluded from Vol. III, p. 177).

Nomenclature.

There is one subject upon which, from my official position elsewhere, I desire to take the opportunity of saying a few words. It is that of Nomenclature. It is not on its technical side, I am afraid, of sufficient general interest to justify my devoting to it the space which its importance would otherwise deserve. But I hope to be able to enlist your support for the broad common-sense principles on which our practice should rest.

As I suppose everyone knows, we owe our present method of nomenclature in natural history to Linnæus. He devised the binominal, or, as it is often absurdly called, the binomial system. That we must have a technical system of nomenclature I suppose no one here will dispute. It is not, however, always admitted by popular writers who have not appreciated the difficulty of the matter, and who think all names should be in the vernacular. There is the obvious difficulty that the vast majority of plants do not possess vernacular names, and the attempts to manufacture them in a popular shape have met with but little success. Then, from lack of discriminating power on the part of those who use them, vernacular names are often ambiguous; thus Bullrush is applied equally to *Typha* and to *Scirpus*, plants extremely different. Vernacular names, again, are only of local utility, while the Linnean system is intelligible throughout the world.

A technical name, then, for a plant or animal is a necessity, as without it we cannot fix the object of our investigations into its affinity, structure or properties, 'Nomina si nescis perit et cognitio rerum.'[26]

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[26] *Linn. Phil.*, 210.

In order to get clear ideas on the matter let us look at the logical principles on which such names are based. It is fortunate for us that these are stated by Mill, who, besides being an authority on logic, was also an accomplished botanist. He tells us:[27] 'A naturalist, for purposes connected with his particular science, sees reason to distribute the animal or vegetable creation into certain groups rather than into any others, and he requires a name to bind, as it were, each of his groups together.' He further explains that such names, whether of species, genera or orders, are what logicians call connotative: they *denote* the members of each group, and *connote* the distinctive characters by which it is defined. A species, then, connotes the common characters of the individuals belonging to it; a genus, those of the species; an order, those of the genera.

But these are the logical principles which are applicable to names generally. A name such as *Ranunculus repens* does not differ in any particular from a name such as John Smith, except that one denotes a species, the other an individual.

This being the case, and technical names being a necessity, they continually pass into general use in connection with horticulture, commerce, medicine and the arts. It seems obvious, that if science is to keep in touch with human affairs, stability in nomenclature is a thing not merely to aim at but to respect. Changes become necessary, but should never be insisted on without grave and solid reason. In some cases they are inevitable unless the taxonomic side of botany is to remain at a standstill. From time to time the revision of a large group has to be undertaken from a uniform and comparative point of view. It then often occurs that new genera are seen to have been too hastily founded on insufficient grounds, and must therefore be merged in others. This may involve the creation of a large number of new names, the old ones becoming henceforth a burden to literature as synonyms. It is usual in such cases to retain the specific portion of the original name, if possible. If it is, however, already preoccupied in the genus to which the transference is made, a new one must be devised. Many modern systematists have, however, set up the doctrine that a specific epithet once given is indelible, and whatever the taxonomic wanderings of the organism to which it was once assigned, it must always accompany it. This, however, would not have met with much sympathy from Linnæus, who attached no importance to the specific epithet at all: 'Nomen specificum sine generico est quasi pistillum sine campana.'[28] Linnæus always had a solid reason for everything he did or said, and it is worth while considering in this case what it was.

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[27] *System of Logic*, i. 132.

Before his time the practice of associating plants in genera had made some progress in the hands of Tournefort and others, but specific names were still cumbrous and practically unusable. Genera were often distinguished by a single word; and it was the great reform accomplished by Linnæus to adopt the binominal principle for species. But there is this difference. Generic names are unique, and must not be applied to more than one distinct group. Specific names might have been constituted on the same basis; the specific name in that case would then have never been used to designate more than one plant, and would have been sufficient to indicate it. We should have lost, it is true, the useful information which we get from our present practice in learning the genus to which the species belongs; but theoretically a nomenclature could have been established on the one-name principle. The thing, however, is impossible now, even if it were desirable. A specific epithet like *vulgaris* may belong to hundreds of different species belonging to as many different genera, and taken alone is meaningless. A Linnean name, then, though it consists of two parts, must be treated as a whole. 'Nomen omne plantarum constabit nomine generico et specifico.'[29] A fragment can have no vitality of its own. Consequently, if superseded, it may be replaced by another which may be perfectly independent.[30]

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[28] *Phil.* 219. [29] *Phil.*, 212.

It constantly happens that the same species is named and described by more than one writer, or different views are taken of specific differences by various writers; the species of one are therefore 'lumped' by another. In such cases, where there is a choice of names, it is customary to select the earliest published. I agree, however, with the late Sereno Watson[31] that 'there is nothing whatever of an ethical character inherent in a name, through any priority of publication or position, which should render it morally obligatory upon any one to accept one name rather than another.' And in point of fact, Linnæus and the early systematists attached little importance to priority. The rigid application of the principle involves the assumption that all persons who describe or attempt to describe plants are equally competent to the task. But this is so far from being the case that it is sometimes all but impossible even to guess what could possibly have been meant.[32]

In 1872 Sir Joseph Hooker[33] wrote: 'The number of species described by authors who cannot determine their affinities increases annually, and I regard a naturalist who puts a described plant into its proper position in regard to its allies as rendering a greater service to science than its describer when he either puts it into a wrong place or throws it into any of those chaotic heaps, miscalled genera, with which systematic works still abound.' This has always seemed to me not merely sound sense, but a scientific way of treating the matter. What we want in nomenclature is the maximum amount of stability and the minimum amount of change compatible with progress in perfecting our taxonomic system. Nomenclature is a means, not an end. There are perhaps 150,000 species of flowering plants in existence. What we want to do is to push on the task of getting them named and described in an intelligible manner, and their affinities determined as correctly as possible. We shall then have material for dealing with the larger problems which the vegetation of our globe will present when treated as a whole. To me the botanists who waste their time over priority are like boys who, when sent on an errand, spend their time in playing by the roadside. By such men, even Linnæus is not to be allowed to decide his own names. To one of the most splendid ornaments of our gardens he gave the name of *Magnolia grandiflora;* this is now to be known as *Magnolia fœtida.* The reformer himself is constrained to admit, 'The change is a most unfortunate one in every way.'[34] It is difficult to see what is gained by making it, except to render systematic botany ridiculous. The genus *Aspidium*, known to every fern cultivator, was founded by Swartz. It now contains some 400 species, of which the vast majority were of course unknown to him at the time; yet the names of all these are to be changed because Adanson founded a genus, *Dryopteris*, which seems to be the same thing as *Aspidium.* What, it may be asked, is gained by the change? To science it is certainly nothing. On the other hand, we lumber our books with a mass of synonyms, and perplex everyone who takes an interest in ferns. It appears that the name of the well-known Australian genus, *Banksia*, really belongs to *Pimelea*; the species are therefore to be renamed, and *Banksia* is to be rechristened *Sirmuellera*, after Sir Ferdinand von Mueller; a proposal which, I need hardly say, did not emanate from an Englishman.

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[30] As Alphonse de Candolle points out in a letter published in the *Bull. de la Soc. bot. de France* (xxxix), 'the real merit of Linnæus has been to combine, for all plants, the generic name with the specific epithet.' It is important to remember that in a logical sense the 'name' of a species consists, as Linnæus himself insisted, in the combination, not in the specific epithet, which is a mere fragment of the name, and meaningless when taken by itself.

[31] *Nature*, xlvii. 54.

[32] Darwin, who always seems to me, almost instinctively, to take the right view in matters relating to natural history, is (*Life*, vol. i, p. 364) dead against the new 'practice of naturalists appending for perpetuity the name of the *first* describer to species.' He is equally against the priority craze:—'I cannot yet bring myself to reject very *well-known* names.' (*ibid.* p. 369).

[33] *Flora of British India*, i, vii.

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[34] *Garden and Forest*, ii. 615.

I will not multiply instances. But the worst of it is that those who have carefully studied the subject know that, from various causes which I cannot afford the time to discuss, when once it is attempted to disturb accepted nomenclature, it is almost impossible to reach finality. Many genera only exist by virtue of their redefinition in modern times; in the form in which they were originally promulgated they have hardly any intelligible meaning at all.

It can hardly be doubted that one cause of the want of attention which systematic botany now receives is the repulsive labor of the bibliographical work with which it has been overlaid. What an enormous bulk nomenclature has already attained may be judged from the *Index Kewensis*, which was prepared at Kew, and which we owe to the munificence of Mr. Darwin. In his own studies he constantly came on the track of names which he was unable to run down to their source. This the *Index* enables to be done. It is based, in fact, on a manuscript index which we compiled for our own use at Kew. But it is a mistake to suppose that it is anything more than the name signifies, or that it expresses any opinion as to the validity of the names themselves. That those who use the book must judge of for themselves. We have indexed existing names, but we have not added to the burden by making any new ones for species already described.

What synonymy has now come to may be judged by an example supplied me by my friend, Mr. C. B. Clarke. For a single species of *Fimbristylis* he finds 135 published names under six genera. If we go on in this way we shall have to invent a new Linnæus, wipe out the past, and begin all over again.

Although I have brought the matter before the Section it is not one in which this, or indeed any collective assembly of botanists, can do very much. While I hope I shall carry your assent with the general principles I have laid down, it must be admitted that the technical details can only be appreciated by experienced specialists. All that can be hoped is a general agreement amongst the staffs of the principal institutions in different countries where systematic botany is worked at; the free-lances must be left to do as they like.

VEGETABLE PHYSIOLOGY.

In an address which I delivered at the Bath meeting in 1888, I ventured to point out the important part which the action of enzymes would be found to play in plant metabolism. My expectations have been more than realized by the admirable work of Professor Green on the one hand, and of Mr. Horace Brown on the other. The wildest imagination could not have foreseen the developments which in the hands of animal physiologists would spring from the study of the fermentative changes produced by yeast and bacteria. These, it seems to me, bid fair to revolutionize our whole conceptions of disease. The reciprocal action of ferments, developed in so admirable a manner by Marshall Ward in the case of the ginger-beer plant, is destined, I am convinced, to an expansion scarcely less important.

We owe to Mr. Blackman a masterly demonstration of the fact, long believed, but never perhaps properly proved, that the surface of plants is ordinarily impermeable to gases. Mr. Dixon has brought forward some new views about water-movement in plants, which I confess I found less instructive than many of my brother botanists. They are expressed in language of extreme technicality; but, as far as I understand them, they amount to this. The water moving in the plant is contained in capillary channels; as it evaporates at the surface of the leaves, a tensile strain is set up, as long as the columns are not broken, to restore the original level. I can understand that in this way the 'transpiration current' may be maintained. But what I want to know is, how this explains the phenomena in the sugar maple, a single tree of which will yield, I believe, 20-30 gallons of fluid before a single leaf is expanded.

We owe to Messrs. Darwin and Acton the supply of a 'Manual of Practical Vegetable Physiology,' the want of which has long been keenly felt. Like the father of one of the authors, 'I love to exalt plants' (i, 98). I have long been satisfied that the facts of vegetable physiology are capable of being widely taught, and are not less significant and infinitely more convenient than most of those which can be easily demonstrated on the animal side. How little any accurate knowledge of the subject has extended was conspicuously demonstrated in a recent discussion at the Royal Society, when two of our foremost chemists roundly denied the existence of a function of respiration in plants, because it was unknown to Liebig!

ASSIMILATION.

The greatest and most fundamental problem of all is that of assimilation. The very existence of life upon the earth ultimately depends upon it. The veil is slowly, but I think surely, being lifted from its secrets. We now know that starch, if its first visible product, is not its first result. We are pretty well agreed that this is what I have called a 'proto-carbohydrate.' How is the synthesis of this effected? Mr. Acton made some remarkable researches, which were communicated to the Royal Society in 1889, on the extent to which plants could take advantage of organic compounds made, so to speak, ready to their hand. Loew, in a remarkable paper, which will perhaps attract less attention than it deserves from being published in Japan,[35] has, from the study of the nutrition of bacteria, arrived at some general conclusions in the same direction. Bokorny appears recently to have similarly experimented on algæ. Neither writer, however, seems to have been acquainted with Acton's work. The general conclusion which I draw from Loew, is to strengthen the belief that form-aldehyde is actually one of the first steps of organic synthesis, as long ago suggested by Adolph Baeyer. Plants, then, will avail themselves of ready-made organic compounds which will yield them this body. That a sugar can be constructed from it has long been known, and Bokorny has shown that this can be utilized by plants in the production of starch.

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[35] *Bull. College of Agric. Imp. Univ. Tokio*, vol. ii.

The precise mode of the formation of form-aldehyde in the process of assimilation is a matter of dispute. But it is quite clear that either the carbon dioxide or the water, which are the materials from which it is formed, must suffer dissociation. And this requires a supply of energy to accomplish it. Warington has drawn attention to the striking fact that in the case of the nitrifying bacterium, assimilation may go on without the intervention of chlorophyll, the energy being supplied by the oxidation of ammonia. This brings us down to the fact, which has long been suspected, that protoplasm is at the bottom of the whole business, and that chlorophyll only plays some subsidiary and indirect part, perhaps, as Adolph Baeyer long ago suggested, of temporarily fixing carbon oxide like hæmoglobin, and so facilitating the dissociation.

Chlorophyll itself is still the subject of the careful study by Dr. Schunck, originally commenced by him some years ago at Kew. This will, I hope, give us eventually an accurate insight into the chemical constitution of this important substance.

The steps in plant metabolism which follow the synthesis of the proto-carbohydrate are still obscure. Brown and Morris have arrived at the unexpected conclusion that 'cane-sugar is the first sugar to be synthesised by the assimilatory processes.' I made some remarks upon this at the time,[36] which I may be permitted to reproduce here.

"The point of view arrived at by botanists was briefly stated by Sachs in the case of the sugar-beet, starch in the leaf, glucose in the petiole, cane-sugar in the root. The facts in the sugar-cane seem to be strictly comparable.[37] Cane-sugar the botanist looks on, therefore, as a 'reserve material.' We may call 'glucose' the sugar 'currency' of the plant, cane-sugar its 'banking reserve.'

"The immediate result of the diastatic transformation of starch is not glucose, but maltose. But Mr. Horace Brown has shown in his remarkable experiments on feeding barley embryos, that, while they can readily convert maltose into cane-sugar, they altogether fail to do this with glucose. We may conclude, therefore, that glucose is, from the point of view of vegetable nutrition, a somewhat inert body. On the other hand, evidence is apparently wanting that maltose plays the part in vegetable metabolism that might be expected of it. Its conversion into glucose may be perhaps accounted for by the constant presence in plant tissues of vegetable acids. But, so far, the change would seem to be possibly disadvantageous. Perhaps, glucose, in the botanical sense, will prove to have a not very exact chemical connotation.

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[36] *Journ. Chem. Soc.*, 1893, 673.

[37] *Kew Bulletin*, 1891,3 5-41.

"That the connection between cane-sugar and starch is intimate, is a conclusion to which both the chemical and the botanical evidence seems to point. And on botanical grounds this would seem to be equally true of its connection with cellulose.

"It must be confessed that the conclusion that 'cane-sugar' is the first sugar to be synthesised by the assimilatory processes seems hard to reconcile with its probable high chemical complexity, and with the fact that, botanically, it seems to stand at the end and not at the beginning of the series of metabolic change."

PROTOPLASMIC CHEMISTRY.

The synthesis of proteids is the problem which is second only in importance to that of carbohydrates. Loew's views of this deserve attentive study. Asparagin, as has long been suspected, plays an important part. It has, he says, two sources in the plant. 'It may either be formed directly from glucose, ammonia (or nitrates) and sulphates, or it may be a transitory product between protein-decomposition and reconstruction from the fragments.'[28]

In the remarks I made to the Chemical Society I ventured to express my conviction that the chemical processes which took place under the influence of protoplasm were probably of a different kind from those with which the chemist is ordinarily occupied. The plant produces a profusion of substances, apparently with great facility, which the chemist can only build up in the most circuitous way. As Victor Meyer[39] has remarked: 'In order to isolate an organic substance, we are generally confined to the purely accidental properties of crystallization and volatilization.' In other words, the chemist only deals with bodies of great molecular stability; while it cannot be doubted that those which play a part in the processes of life are the very opposite in every respect. I am convinced that if the chemist is to help in the field of protoplasmic activity, he will have to transcend his present limitations, and be prepared to admit that as there may be more than one algebra, there may be more than one chemistry. I am glad to see that a somewhat similar idea has been suggested by other fields of inquiry. Professor Meldola[40] thinks that the investigation of photochemical processes 'may lead to the recognition of a new order of chemical attraction, or of the old chemical attraction in a different degree.' I am delighted to see that the ideas which were floating, I confess, in a very nebulous form in my brain, are being clothed with greater precision by Loew.

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[28] *Loc. cit.*, 64.

In the paper which I have already quoted, he says of proteids:[41] 'They are *exceedingly labil compounds* that can be easily converted into relatively stable ones. A great lability is the indispensable and necessary foundation for the production of the various actions of the living protoplasm, for the mode of motions that move the life-machinery. There is a *source of motion* in the labil position of atoms in molecules, a source that has hitherto not been taken into consideration either by chemists or by physicists.

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[39] *Pharm. Journ.*, 1890, 773. [40] *Nature*, xlii. 250. [41] *Loc. cit.*, 13.

REVIEWS AND CRITICISMS.

Synoptical Flora of North America, Vol. I, Part I, Fascicle I. Polypetalæ from the Ranunculaceæ to the Frankeniaceæ. By ASA GRAY, LL.D., and SERENO WATSON, Ph. D. Continued and edited by BENJAMIN LINCOLN ROBINSON, Ph. D. Issued October 10, 1895.

When Dr. Gray took up alone the preparation of the Synoptical Flora he began where the unfinished Flora of North America by John Torrey and Asa Gray ended, and wrote first the Gamopetalous orders after Compositæ. This portion was published in 1878 as Vol. II, Part I, and was followed in 1884 by Vol. I, Part II, including the Gamopetalæ from Caprifoliaceæ through Compositæ. Thus the Synoptical Flora stood at the death of Gray in 1888 — half completed. However, the author had been engaged upon a revision of the Polypetalous orders, for Vol. I, Part I, the manuscript for which he had partly finished. This manuscript, or at least the larger portion of it, forms the body of the fascicle which is now published and which is the first revision of the Polypetalæ of North America that has been attempted within a half century.

The name of Dr. Sereno Watson appears upon the cover as collaborator, but the description of nine genera of Cruciferæ is all that is in view as his work. No critical insight would be necessary to perceive that another and younger hand had prepared the manuscript for the printer. This has been the special office of Dr. Robinson, the successor of Dr. Watson as Curator of the Gray Herbarium. His task has been, even for this fascicle, no light one, and by reason of many considerations, peculiarly difficult. It has been necessary to revise in many places the work of Gray in the light of recent investigations, and it has also fallen to the editor to elaborate anew a considerable number of genera to supply gaps in the manuscript as left by his predecessors. Further, it has been his editorial duty to review the literature of the last seven years relating to the subject matter in hand. During that time hundreds of new species have been described, many generic disturbances have been brought about, a great many observations have been made and facts recorded.

It does not require a long perusal of the present pages to dispose one to the opinion that Dr. Robinson has performed his task felicitously. For the manuscript as left by Dr. Gray in 1888 has been so edited that it is in spirit, as nearly as the editorial function could bring it, of the year 1895. The material which has been interpolated in the body of the manuscript and appears in the form of footnotes is, according to our light, by far the most interesting feature of these pages, and the most useful. One finds a convenient record and analysis of some things that have been said and nearly all that have been written in recent years up to within the last few months on the American botany of these orders. Descriptions of new species by the editor frequently appear; transcripts of descriptions of species by other authors have been added; equivalents are given for such recently published species as the editor sees fit to reject; "species of uncertain or doubtful affinity," (all, curiously, of a single author), have their characters transcribed and find place at the end of the genus to which they belong; opinions and comments are set down; localities, new stations and references are gathered together from many sources.

The manuscript as left by Dr. Gray offers little that is new. In Eschscholtzia it is interesting to note that twelve species are described, but we are inclined to believe that the analysis will be found unsatisfactory in not a few particulars. It seems to us that the general treatment of Cruciferæ will be found least wanting. Thysanocarpus is bereaved of Athysanus which latter Dr. Gray in 1885 thought to be only a species of the former genus characterized by a wingless silicle. *Streptanthus barbiger, niger* and *secundus*, all of Greene, are given place, while *S. pulchellus* and *Bioletti* of the same author are referred to *S. hispidus*, Gray, as is also *S. Mildredæ*, Greene. *S. suffrutescens* is recognized and *S.*

orbiculatus is named as a synonym of *S. tortuosus*, Kellogg. *S. hesperidis* is reduced to *S. Breweri*, Gray, with which we are not inclined to quarrel. Dentaria is sustained as distinct from Cardamine by virtue of relative size of flowers and seeds, and form of pods—technical distinctions being strictly absent. The Western species placed under this genus need much patient study. For the present, however, we are unwilling to assent to the proposition that there are so few as five "definable species" in Western America.

It is easy in our region, we are ready to admit, by disregarding the solution of a genus as a whole to pick out striking forms and describe them as species. It is likewise easy to "remand" these. Nothing is quite so much needed in many of our peculiar West American genera as the judicious extension of specific diagnoses to include other than type forms. Not the less needed are rather full and accurate descriptions of the array of anomalous forms.

We do not wish to be given to pessimistic opinions but no settlement of the annual species in such a genus as Streptanthus is likely soon to be agreed upon. We think that no one has a very definite conception of the amount and degree of periodic variation from year to year in the Coast Ranges of California. We are not the first who have been impressed by the apparent disappearance of "species," but little notice has been taken of the smaller variations which are in evidence at intervals but which no one has seen fit to describe as varieties or forms. In any event the rejection of Cheiranthus as a genus, the complexion of Eschscholtzia, and many other things in the fascicle must come as something of a shock to those who have so long accepted the Botany of California as their book of the laws and the prophets.

While the Synoptical Flora can at the present time be only provisional in so far as it relates to many West American genera, it need not as a forerunner be the less useful or the less worthy of praise. In fact the present fascicle seems to us most praiseworthy in that it bears more the marks of a tentative work than any of the parts which have gone before;

one more easily infers it; there is more constant suggestiveness to that effect.

It is hardly necessary to observe that the present fascicle will be found on the working shelf of all Western botanists by the side of the former parts which have been in constant service since the day of their issue; and, moreover, succeeding fascicles will be expectantly awaited. Nevertheless, it is a large hope that the Synoptical Flora may be carried to a successful conclusion within a reasonably short period. It needs no learned disquisition to support the statement that the space of a lifetime is too brief for one man, however learned or industrious, to write a systematic treatise on the phanerogamic botany of North America which shall be distinguished by unity of plan and consistency of treatment.

With such considerations in mind we judge that Dr. Robinson has done well to call to his aid specialists to assist by the preparation of certain orders for the next fascicle. It is, however, quite plain that the successful accomplishment of this undertaking must largely arise out of a zealous devotion to the memory of Dr. Gray. And it is just here that the danger lies. For the too ardent disciple ever holds as sacred the words last spoken by the master, disregarding the arrival of new days or change of conditions. But we are led to believe from the free manner in which Dr. Robinson has in a number of places modified Gray's manuscript in view of the work done by recent monographers, that he has derived his inspiration, not from the "expressed views" and "well-known wishes" of the author, but rather from the talents and qualities and personal characteristics that marked Asa Gray as America's most uncommon scientific man. If this be so its young editor is endowed with an inspiration that will not wither with age and the Synoptical Flora may well go on to completion in honor of, rather than as if by him, to whom was due its inception.—W. L. Jepson.

MISCELLANEOUS NOTES AND NEWS.

PERAPHYLLUM RAMOSISSIMUM, Nutt., is figured in Curtis' Botanical Magazine for June, 1895. 7420. Sir Joseph Hooker appends the following note to his description: "*Peraphyllum ramosissimum* seems to have a very interrupted distribution, being nowhere very common, but occupying a wide area, from the Blue Mountains in Oregon to Southwestern Colorado, Southern Utah and California. It has been grown in the Arboretum of Kew for upwards of twenty years, where it forms a shrub about three feet high, but was never observed to flower till May, 1894. It is probably one of Dr. Asa Gray's seed contributions to the Royal Gardens." An anonymous writer in the *Kew Bulletin* for June and July alludes to the fact that the season of 1894 was one to be remembered by English horticulturists for the number of plants which flowered at Kew for the first time in consequence of the unusual amount of sunshine during the previous summer and autumn.

THE death of Professor Hellriegel at the age of sixty-four is announced. He was the discoverer of the fact that leguminous plants are capable of absorbing free nitrogen from the air through the agency of micro-organisms existing in the nodules on their roots.

ON SOME CALIFORNIAN MIMULI.

By Edward L. Greene.

In publishing, a year since, in the *London Journal of Botany*, the *Mimulus implexus* of the Sierra Nevada, I made an unfortunate mistake in assigning to that species an "exceedingly thin-membranaceous" leaf-texture. The plant which I had in mind, as to the matter of texture of herbage, is one which, although growing in the same district, and often along with *T. implexus*, I last summer discovered to be a totally different thing; and I here name it

Mimulus corallinus. Perennial by strings of fragile moniliform white rootstocks, the joints of these short-claviform; proper roots slender-fibrous: stems erect, slender, 4 to 12 inches high, simple or with branches from the base, leafy up to the short raceme, bright green, appearing glabrous, but more or less hispidulous-puberulent under a lens: leaves very thin membranaceous, neither viscid nor slimy, ovate or round-ovate, short-petioled or subsessile, saliently toothed, the floral much reduced, not connate: flowers few, short-pedicelled, about 1 inch long; the strongly bilabiate corolla about ¾ inch broad.

Inhabiting dry alluvial banks, either in the open, or in shade of bushes; the rootstocks sometimes with shorter and thicker joints, thus becoming actual jointed tubers, as in *M. moniliformis*. Plentiful along the western base of the Washoe Mountains beyond Truckee, but also near Summit Station, from which latter district it has been distributed by me under the name of *M. Tilingi.*

In *M. implexus*, Greene, Journ. Bot. xxxiii. 8, the leaves are not only of unusual thickness and fleshiness of texture; they are entirely covered by translucent dewy-looking particles, so that upon being handled, especially with moist hands, these particles burst, and cover the leaf surface at once with a thick albuminous slime. The character of the underground part of this species is, as I have more than once before described it, altogether unique.

Erythea, Vol. IV., No. 2 [1 February, 1896].

MIMULUS PRIMULOIDES, Benth. Scroph. Ind. 29 (1835). Mr. Bentham's characterization of this plant is as follows: "Glabrous, stoloniferous; flowering branches short; leaves subsessile, obovate, obscurely dentate or very entire: pedicel elongated, solitary, terminal: calyx tubular, short-toothed." It is an insufficient account to have given of one of the most beautiful species of the genus. The corolla is about ¾ of an inch long, nearly as broad; the limb almost perfectly regular, each one of the 5 lobes being notched deeply, almost to the obcordate, so that it is in actual appearance 10-lobed. With this large-flowered, large-leaved glabrous plant, the following has long been confused.

Mimulus pilosellus. Very small, depressed, compact and almost moss-like: leaves ¼ to ⅛ inch long, round-obovate, obtuse, more or less cuneate at base, sessile, glabrous beneath, hoary above with white jointed hairs nearly as long as the diameter of the leaf; stems also similarly pilose but these hairs not as long: corolla only ¼ inch broad.

Habitat of the preceding, and even more common; often hybridizing with it; so that forms variously intermediate between the two are very common. The species are, nevertheless, doubtless two, the intermediates evidently natural hybrids, and not merely intergradational forms.

Attention having been called in the last volume of ERYTHEA, page 179, to the beautiful mimuloid shrub from Southern California, published in *Garden and Forest* for last April, it may here be noted that the plant is clearly no *Mimulus*, but a perfect *Diplacus*, to be called

Diplacus Clevelandi. *Mimulus Clevelandi*, Brandg., in Gard. & Forest, viii, 134, f. 20.

NEW KANSAS FUNGI.

By J. B. Ellis and Elam Bartholomew.

(Concluded from Vol. IV, p. 4).

Dothiorella concaviuscula. On dead branches of *Fraxinus viridis*, Jan., 1895 (No. 1635).

Stromata orbicular, ½ mm. diam., or by confluence 1 mm. or more long, at first covered, but soon splitting and raising the cuticle and exposing the flat or slightly concave summit, black outside, gray or horn-color within. In the smaller orbicular form there is only a single sporigerous nucleus, but on the elongated forms there are 2–4, a little lighter than the surrounding substance of the stroma, but otherwise scarcely distinguishable from it. Sporules oblong or oblong-elliptical, hyaline, continuous, 4–6x2½–3μ.

Dothiorella Negundinis. On bark of dead limbs of *Negundo aceroides*, Aug., 1894 (No. 1558).

Perithecia minute (100–110μ diam.) perforated above, erumpent in crowded, flattened groups, 1–1½ mm. across, scarcely projecting above the surface of the bark. Sporules elliptical, smoky, hyaline, 5–6x4–5μ.

Cytispora juglandicola. On bark of dead limbs of *Juglans nigra*, Nov. 30, 1894 (No. 1606).

Stromata scattered, orbicular, small, (1 mm. diam.), multilocular, protuberant above and piercing the epidermis with a small, snow-white disk, which is pierced in the center with a single pore and finally disappears. Sporules allantoid, hyaline, only slightly curved, 3½–4x1μ, borne on fasciculate basidia 10–11μ long, attenuated above.

C. juglandina, Sacc., has sporules about twice as long and no white disk. Very abundant on young trees killed by fire last spring.

Sphaeropsis Amorphae. On dead branches of *Amorpha fruticosa*, Dec., 1894 (No. 1630).

Perithecia thickly scattered, subcuticular, ovate-globose, about ½ mm. diameter, raising and splitting or piercing the epidermis, but not erumpent. Sporules oblong-elliptical, brown, 20–22x7–8μ.

Haplosporella velata. On dead stems of *Celastrus scandens*, Jan., 1895 (No. 1648).

Stromata orbicular, or elliptical, obtusely conical, slaty black inside, raising the epidermis into distinct pustules which are cleft across the summit, the open cleft being filled with gray, fine granular matter. Perithecia reduced to mere light-colored cells in the substance of the stroma. Sporules oblong, obtuse, continuous, brown, 12–16x5–6μ. The bark around the stroma is not at all blackened, but rather whitened or bleached.

Diplodia lophiostomoides. On decorticated limbs of *Negundo aceroides*, July, 1895 (Bartholomew, No. 1780).

Perithecia gregarious, at first covered by the loosened fibers of the wood, then erumpent, globose or elliptical, ¼ mm. diam., or ⅓x¼ mm., ostiolum often slightly compressed. Sporules oblong, elliptical, 15–20x6–7μ, uniseptate, scarcely constricted.

Diplodia (?) subterranea. On a pine post below the surface of the ground, Jan. 10, 1895 (No. 1652).

Perithecia erumpent, superficial, ½–¾ mm. diam., subastomous, with very thin membranous walls which soon fall away, leaving a mass of brown, elliptical uniseptate constricted spores, 6–8x3½–4μ. No basidia seen.

The thin-walled perithecia and the pulverulent mass of spores make this an abnormal species if, in fact, it should be called a Diplodia.

Diplodia clavispora. On decaying wood of an old elm stump, May, 1894 (No. 1475).

Perithecia erumpent, superficial, closely gregarious, conical, rough, black, about 200x100μ diam. Sporules wedge-shaped, brown, uniseptate, and slightly constricted, 6–8x3–3½μ. Some of the perithecia contain minute *Phoma* spores.

Diplodiella striispora. On decorticated cottonwood stump, Jan., 1894 (No. 1356).

Perithecia superficial, ovate, opaque, 300–400μ diam., with a prominent papilliform ostiolum, soon perforated. Sporules elliptical, deep brown, uniseptate, scarcely constricted, striate, 18–23x12–14μ.

Diplodina Psoraleæ. On dead stems of *Psoralea tenuiflora*, Dec., 1893 (No. 1323).

Perithecia erumpent, scattered or 2–3 together, subseriate or subconnate, hemispherical, soon flattened-subdiscoid or even collapsing, 250–350μ diam., orbicular or elliptical, perforated at the apex. Sporules oblong-fusoid, uniseptate, not constricted, olivaceous, 8–10x2½–3μ.

Septoria alba. On living leaves of *Silphium integrifolium*, Aug., 1894 (No. 1559).

Spots scattered, small, (1–1½ mm.), white, thin, with a slightly raised margin. Perithecia few (1–4) on a spot, innate, 100–110μ diam. Sporules straight, or somewhat abruptly or irregularly bent, hyaline, faintly nucleate, 20–40 (mostly about 25) x 1¼–1½μ. Differs from *S. Silphii*, E. & E., on the same host in its smaller white spots, fewer perithecia and shorter sporules. Heretofore not separated from that species.

Septoria rhabdocarpa. On fallen leaves of *Populus monilifera*, Sept., 1894 (No. 1567).

Perithecia amphigenous, scattered, not on any spots, subcuticular, depressed-spherical, black, ¼–⅓ mm. diam., only slightly prominent, ostiolum indistinct. Sporules bacillary, straight, continuous, hyaline, subobtuse, 15–20x2½–3μ.

Septoria incarnata. On living leaves of *Asclepias incarnata*, July, 1894 (No. 1538).

Spots orbicular, small, (1–2 mm.), subdiscoid, subconcave below, whitish, with a narrow raised border surrounded by a purple stain. Sporules filiform, continuous, faintly nucleate 20–40 (mostly about 25–30) x 1½–2μ.

Hendersonia Pseudacaciæ. On dead limbs of *Robinia Pseudacacia*, March 14, 1894 (No. 1409).

Perithecia thickly scattered, covered by the epidermis, which is raised into pustules and ruptured, but the perithecia are for the most part not erumpent. Sporules oblong-elliptical or cylindrical, obtuse, brown, mostly a little curved, 15–22x6–10μ, scarcely constricted at the septa.

Differs from *Camarosporium celtidis*, E. & E., in the absence of any longitudinal septa, and from *Hendersonia fusarioides*, Sacc., in its shorter, broader sporules.

Hendersonia Fraxini. On dead limbs of *Fraxinus viridis*, March 6, 1895 (No. 1676).

Perithecia erumpent from the bleached fibers of the inner bark, from which the epidermis has fallen, about ¼ mm. diam., subhemispherical becoming more or less flattened. Sporules oblong-elliptical, 3- (exceptionally 4-) septate, not constricted; hyaline and continuous at first, finally brown, 11–13x5–6μ.

H. Pyri, Fckl, has basidia much longer than the sporules, but in the Kansas specimens no basidia were observed.

Pestalozzia Kansensis. On old dead leaves of *Quercus macrocarpa*, Jan., 1894 (No. 1357).

Acervuli hypophyllous. Conidia oblong-fusoid, 4–septate, the terminal cells hyaline and conical, the three inner cells pale brown (not yellow brown), entire length 16–18μ, colored part 11–13x5–5½μ, terminal bristle oblique, 15–20μ long, pedicels about 15μ long.

Comes near *Pestalozzia Saccardoi*, Speg., which differs in having the inner cells nearly opaque. *P. pallida*, E. & E., has the conidia rather smaller and nearly hyaline.

Pestalozzia Œnotheræ. On dead stems of *Œnothera biennis*, March 7, 1895 (No. 1682).

Acervuli gregarious, erumpent-superficial, orbicular or subelliptical, ½–¾ mm. diam. Conidia obclavate-oblong, 3–septate, not constricted, subinequilateral or slightly curved, 10–12x3–4μ, rounded at the base, acute at the apex; terminal cell mostly hyaline, surrounded by a short, hyaline, mostly oblique bristle, 5–7μ long and generally arising from a point a little to one side of the apex.

This is closely allied to *P. Mochæta*, Desm., but the acervuli are larger and the mature conidia have only the terminal cell hyaline and sometimes all the cells are pale brown; the conidia are also different in shape.

Pestalozzia fibriseda. On weather-beaten wood of *Rhus glabra* (No. 1931).

Acervuli gregarious, subhysteriform, ½–1 mm. long. Conidia oblong-elliptical, 3-septate (5-septate including the two septa that cut off the small, terminal, hyaline cells), brown, 15–20x8μ, with slender pedicels about 25μ long and a short (10–12μ), oblique terminal bristle.

Labrella infuscans. On weather-beaten pine boards, March, 1894 (No. 1425).

Perithecia subelliptical, minute, flattened, and very thin above with an elongated opening as in *Hysterium*, minute (¼ mm. long), black, not polished, when dry more or less collapsing and the opposite sides rolling together, as in *Hysterium*, with the sides loosely close. Texture of the perithecia rather coarsely cellular with a tinge of green (under the microscope). Sporules short-elliptical or subglobose, hyaline, without nuclei. The perithecia are gregarious, on elliptical spots slightly darker than the surrounding wood, by which it is easily recognized.

Cladosporium brevipes. On living leaves of *Populus monilifera*, Sept. 18, 1894 (No. 1576).

Spots orbicular, grayish brown with a darker border, 3–6 mm. diam., caused by the puncture of an insect. Hyphæ amphigenous, short (12–15μ), forming black tufts thickly scattered over the central parts of the spots. Conidia, oblong-fusoid, yellowish, continuous or uniseptate (exceptionally 2 to 3-septate), 12–15x3μ. The hyphæ are about the same size, color and shape as the conidia.

This species is quite common on seedling trees 1–4 feet high on sand bars along streams.

Macrosporium Panici. On living leaves of *Panicum virgatum*, July, 1894 (No. 1525).

Spots small, oblong, 1x½ mm., white, with a reddish-purple border. Hyphæ simple, subcæspitose, multiseptate, 20–30x4μ. Conidia obovate-clavate, 3-septate and sparingly muriform, 20–30x10–12μ. Accompanied by elliptical, 5x3μ, uniseptate *Cladosporium* conidia.

Macrosporium Uredinis. Parasite on Uredo of *Puccinia graminis*, on leaves of "volunteer" oats, Sept. 1894 (No. 1561).

Hyphæ simple, erect, smoky-hyaline, 80–110x3½–4μ, septate. Conidia clavate, 5 to 7-septate and sparingly muriform, mostly prolonged below into a short stipe, yellowish-brown 30–50x12–15μ. Its peculiar host makes this an interesting species.

Clasterisporium Kansense. On under side of a cottonwood post lying on the ground, Sept. 1894 (No. 1563).

Effused, forming thin, black patches, 1–3 mm. across. Hyphæ very short or obsolete. Conidia oblong-fusoid, 3-septate, only very slightly constricted, brown, about 20x3½–4½μ. Ends obtusely pointed. straight or curved. Differs from *C. atrum* (Lk.) in the absence of any pedicel and the uniformly 3-septate conidia.

Cercospora didymospora. On capsules and leaves of *Œnothera Fremonti*, July, 1894 (No. 1506).

Spots dark gray, scattered, small (1–2 mm. diam.), subindefinite, giving the host a clouded appearance. Hyphæ tufted on a tubercular base, 65–70μ diam., simple yellow-brown, subentire, about 10–15x4μ. Conidia subfusoid-cylindrical, nearly straight, only slightly narrowed toward the ends, uniseptate but not constricted, hyaline or slightly yellowish, 15–30x4μ.

Cercospora physalicola. On living leaves of *Physalis Virginica*, July, 1894 (No. 1529).

Spots suborbicular, dark reddish-brown, ½–1 cm. diam., mostly bounded by a narrow black line, especially so the smaller spots. Hyphæ epiphyllous, tufted, olivaceous, continuous, subgeniculate above, 60–75x5μ. Conidia hyaline, 110–150x5μ, faintly 4–6 or more septate.

Sporodesmium exasperatum. On the bottom of an oaken barrel in a cellar, May 10, 1894 (No. 1461).

Pulvinate, 1–4 mm. diam., subconfluent, black. Conidia varying in size from a single globose cell 5–7μ diam. to subglobose, obovate, or irregular shaped, uniseptate, quadrate or variously septate, subpedicellate, 10–20μ diam., all distinctly roughened with small subhyaline warts. The wood around the pulvinate tufts is stained purple-red.

BIOGRAPHICAL SKETCH OF M. S. BEBB.

By S. B. Parish.

Michael S. Bebb was born December 23d, 1833, at Hamilton, Ohio. His father was a leading member of the Ohio bar, and in 1846 was elected Governor of that State. Subsequently Governor Bebb removed with his family to the neighborhood of the present city of Rockford, Illinois, where he had purchased a large tract of land. Becoming interested in founding a colony near Knoxville, Tennessee, the Governor and his family resided for a time in that city. But the Civil War soon breaking out Governor Bebb, who was ardently loyal to the Union side, was compelled hastily to return to the North.

At this time Mr. Bebb entered the government service at Washington, and continued to be so employed until the conclusion of the war, when, his father having died, he undertook the management of the paternal farm in Illinois. But being by this time married and having a family growing up about him, he removed, with a view to their education, to Rockford, and this beautiful town remained his home for the rest of his life.

In 1872 the position of Botanist to the Department of Agriculture was offered to him, but he declined to accept the office, influenced largely by the dissatisfaction with which he, in common with the other botanists of the day, regarded the summary dismissal of the late Botanist of the Department, Dr. Parry. He hesitated also to give up the freedom of private life, which left him at liberty to devote himself to study, to the care of his family, and to the promotion of the educational and literary interests of his town.

About eleven years ago Mr. Bebb suffered a severe attack of pleurisy, from the effects of which he never fully recovered. This rendered it necessary for him in later years to pass the cold months in Florida or Georgia. Finding himself, at the approach of the present winter in very feeble health he determined to try the milder climate of Southern California, and on the fifth of November he arrived, accompanied by his wife, at San Bernardino. But his disease was too far advanced to permit any benefit to result from the change, he continued to fail, and on the fifth of December he died, in the sixty-second year of his age.

Mr. Bebb's love of botany began in his youth, while still living in the Ohio home, and he soon made himself familiar with the plants of his neighborhood. His interest in the study was confirmed by the removal to Illinois, where he found himself in the midst of a new flora, then still in its native beauty and variety. While living here his studies were promoted by the kindness of his father, who supplied the young student with the best botanical books of the day.

For a time he gave much study to the Junci, and to him Dr. Engelmann was indebted for many valuable observations and suggestions.

It was not till later that his attention was directed to the Salices. When the material on which the Botany of California was based, was being studied, Mr. Bebb was requested to undertake the willows, more, perhaps, because he was able and willing to devote to them the patience and time that their difficulty and obscurity demanded, than because of any predilection for them. He discharged the task with characteristic thoroughness and discrimination, so that the disposition he then made of the Pacific Coast species has required but few modifications in the light of subsequent investigations.

From this time Mr. Bebb continued to devote his studies to the North American Willows, in knowledge of which he became the undisputed master.

He contributed the articles on Salix in the sixth edition of Gray's Manual, in Rothrock's Report, and in Coville's Botany of Death Valley; indeed in most recent papers, great and small, in which the willows are included, Mr. Bebb's ready help has been resorted to. Many valuable papers on this genus from his pen have appeared in the botanical journals, the last series having been just concluded in *Garden and Forest*. He had in preparation a Monograph of the North American Willows, but it was probably not left in a state sufficiently complete for publication. This is greatly to be regretted, for another will not be easily found who will be willing to undertake the long and patient study necessary to the attainment of that critical knowledge needed for the completion of the work Mr. Bebb has left unfinished.

Mr. Bebb possessed a most attractive personality, which was a true index to his character. To spotless integrity and honor he added an engaging geniality and kindness. The stores of his knowledge were freely opened to all. He was a ready and most interesting conversationalist, but his modest and simple tastes preferred the companionship of home or of a few congenial friends, to the turmoil of general society. He was skillful both with pen and pencil, the latter ability being attested by the many accurate drawings with which he enriched his invaluable herbarium of willows. His services to botany are commemorated by the genus Bebbia, founded by Prof. Greene, a shrubby composite of the arid regions of southeastern California and Arizona.

The death of Mr. Bebb leaves but one or two yet surviving of that famous group of American botanists of which Dr. Gray was the honored head. Their work makes easier that of their successors, and on it the edifice of American botany must be built, whatever may be the fashion of its architecture.

NEW LOCALITIES FOR WEST AMERICAN PLANTS.

By Alice Eastwood.

Artemisia Ludoviciana, Nutt., has never been reported from near San Francisco. There is a clump of it growing on a hill-side near Lake Merced along a little-used, old road.

Cleome integrifolia, Torr. & Gray. This plant so common in the Rocky Mountain Region is rare in California. Mr. William Tevis of Bakersfield has sent specimens collected in San Emidio Canon, Kern Co.

Pentstemon barbatus, Nutt., var *Torreyi*, Gray. Mr. Tevis sends this also from the same locality. It is widely distributed through the Rocky Mountain Region but new to California.

Shepherdia argenta, Nutt. I found this growing in San Emidio Cañon in the fall of 1894. Dr. Franceschi discovered it the same year in the hills of Santa Barbara County. This shrub so common in the Great Basin has not before, I believe, been reported from California.

Hoffmanseggia falcaria, Cav., var. *stricta*, E. M. Fisher, Mr. Tevis discovered near Bakersfield in the summer of 1893. It is abundant there in one locality of limited area. It ranges, "from Kansas southward through the United States and Northern Mexico to Zacatecas and Lower California." This is new to California.

Gnaphalium Wrightii, Gray. Mr. Frank W. Hubby has sent this from the Ojai Valley, Ventura Co., Cal. This I believe has not before been reported from California.

REVIEWS AND CRITICISMS.

Le Jojoba, (*Simmondsia Californica, Nutt.*). By Mons. Leon Diguet. Rev. d. Sci. Nat. Appliquées: October, 1895, pp. 685–686.

The data for this article were collected by the author while recently employed on scientific investigations in Lower California, on behalf of the French Government.

This spreading shrub occurs in the desert regions both of Southern and Lower California, and varies in height, according to situation, from 1½ to nearly 6 feet. It appears to thrive in any condition of soil and situation save where it is very wet, and seems to confine itself to low altitudes. According to M. Diguet the small leaves persist through the most protracted droughts, but the flowers only appear when a greater amount of moisture occurs: if moisture continue, fruits "set," but only mature if several rains have fallen in the course of the year: if water fail, they dry up and fall, no matter what state of development may have been reached. The inhabitants of Lower California eat the fresh seeds, deprived of their covering, like almonds; when dried by fire and ground they are used as a beverage, in the form of tablets made up with sugar, or as a simple infusion. An analysis of the fire-dried seeds shows them to contain 48.30% of fatty matter. The oil solidifies at 5°, is suitable for food and of good quality, and possesses the immense advantage of not turning rancid; in Lower California it is prepared by ebullition with water. M. Diguet recommends this shrub for culture in the desert regions of the French colonies of North Africa.—J. B. D.

An attempt to ascertain the actual dates of publication of the various parts of Rees' Cyclopædia. By BENJAMIN DAYDON JACKSON. London: Pewtress & Co.; 28 Little Queen Street, Lincoln's Inn Fields, W. C.: 1895. 8vo. 8 pp.

Under date of December 4, 1895, Mr. Jackson has issued this valuable little pamphlet as supplementary to his article on the same subject in the *Journal of Botany*, April, 1877, pp, 107, 108, and the tabular statement which he printed and issued in 1880, under the conviction that it "represents all that I shall probably ever be able to ascertain regarding the work."

The Cyclopædia was issued in parts, at uncertain intervals between the years 1802 and 1819, "and on the completion of the work, a set of title-pages was issued, bearing the date of the last, namely 1819 for 39 volumes of letterpress, and 1820 for five volumes of plates."

In spite of much laborious research in the large European libraries there are yet some 26 parts to which Mr. Jackson is unable to assign dates, but for 23 of these the *year* of issue can be decided with tolerable accuracy as they come between others to which dates have been assigned. There are 11 parts of very uncertain date, but of the remaining 48 (altogether there are 85 parts, including plates) the precise dates of issue of 18 have been obtained, and those given for the other 30 can be almost certainly relied upon.

We cannot but regret that this article was not published in a botanical journal. Small pamphlets are apt to be lost sight of within a few years after publication, and are still more apt to become scarce and inaccessible.—J. B. D.

SHORT ARTICLES.

PELARGONIUM ANCEPS, Ait.—Miss Emily Harrison discovered this plant growing along Eleventh St. in E. Oakland three years ago; but it was not identified until the present year. Specimens were sent to Prof. Trelease at St. Louis and he pronounced them the above named species. This is an addition to the flora of North America but can as yet hardly be considered as completely naturalized, since it has not spread from its original place of discovery. It is a native of Southern Africa, that apparent centre for Pelargonium, and has probably been introduced with some seeds or plants from that region. It is not sufficiently near the coast or the harbor to be considered a ballast weed.—A. E.

NEW LOCALITIES FOR TWO INTRODUCED PLANTS—*Convolvulus pentapetaloides*, L., which is reported in the

"Botany of the Bay Region" as common in fields along the eastern base of the Mt. Diablo Range, has been discovered by Mr. L. Jared not far from San Luis Obispo.

Salsola Kali, var. *Tragus*, L. This is the much dreaded Russian thistle already reported in California from Antelope Valley, Kern County. In June, 1895 I found a single plant along the railroad track between Lathrop and the San Joaquin bridge. It is to be expected along all our railroads and ought to be destroyed as soon as discovered.—A. E.

SPHÆROPLEA ANNULINA IN CALIFORNIA.—Wolle in his "Fresh Water Algæ of the United States" (p. 104, 1887) says of this infrequently occurring alga: "It is reported from California but without certain knowledge as to locality." Wille, also, in Engler and Prantl's "Die Natuerliche Pflanzenfamilien" (I Th., 2 Abth., p. 122, 1890) refers doubtfully to North America in the list of localities. The record of which Messrs. Wolle and Wille had such an indefinite idea is to be found in the *Botanical Gazette* for May, 1883, (vol. 8, p. 225) where Farlow says that this plant was collected near San Bernardino, California, by Mrs. Austin. In March, 1895, Miss Sarah P. Monks, of the Los Angeles State Normal School, discovered *Sphæroplea annulina* in considerable abundance and in all stages of development in the Los Angeles River, and it was collected again in the same locality January 4, 1896, by Miss Monks and the writer. It has also been found in Minnesota by MacMillan and MacDougal. (Bot. Gaz., 19; 246–247, 1894.)—W. A. SETCHELL.

OPEN LETTERS.

Calamagrostis scopulorum, Jones.

Mr. T. H. Kearney, Jr., in the *Torrey Bulletin* for December makes a number of false statements which I desire to correct. He says that last winter I submitted to him for determination a Calamagrostis. I never submitted to him for determination any grass or grasses at any time in my life. On the contrary my contract with the Department of Agriculture expressly states that I shall be allowed to determine and describe all new species of the collection and that they shall be published as mine. In the preliminary examination of the grasses I had the friendly aid of Mr. L. H. Dewey. Among the plants which we could not determine was a Calamagrostis which we both thought was new and which I had collected several times before. I took my specimens to the herbarium of grasses but found nothing to match my material. Mr. Kearney asked me to leave the Calamagrostis for a short time, which I did, taking it away after a few days. Nothing was ever said about naming it by either of us but it is now evident that Mr. Kearney intended to repeat the offense against me practised once before by another, and publish it without my knowledge. It is further evident that he has made a strenuous effort to find my duplicate material and describe it but has failed. Mr. Kearney admits that I did not leave the specimens with him to name, but attempts to show that I gave him the impression I would do so at some future time, which is also untrue. Mr. Kearney is also in error as to the relationship of the plant. It is surprising how well he knows its true place, after saying that he has been unable to find any specimens for study.

I was not aware that *Poa festucoides* was preoccupied. My *Poa festucoides*[1] may therefore bear the name of **Poa Kaibensis.**

As to his gratuitous reference to *Elymus salinus*, Mr. F. L. Scribner is reponsible for suggesting its relationship to Hystrix, stating that he thought it was a Hystrix. I differed from him however and still believe that it is an Elymus, other species of which genus have been alternately referred to Agropyrum and Elymus.

The Department of Agriculture should be the last to charge me with discourtesy. In my second Californian collection I discovered a grass which I sent to Dr. Vasey stating that it was new and that I would describe it. He communicated the specimen and my statement to a person now connected with Mr. Kearney's division and the latter deliberately published it without my knowledge or consent. I have the whole correspondence to substantiate my position.

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[1] Jones, Proc. Calif. Acad. 2 Ser. v. 722.

As to the location of the co-types Mr. Kearney discovered before his article was published that they were in my possession. They will remain there till they can be properly labelled and returned to the Department. This is made necessary by the gross blundering of an official of the Department, the details of which it is not necessary to give. I have called this a blunder but the attempt to rob me of my new species leads me to think that I have used the mildest term possible in the case.—MARCUS E. JONES, Salt Lake City, 3 January, 1896.

MISCELLANEOUS NOTES AND NEWS.

THE California Science Association held its second annual meeting in Oakland, January 3-4.

THE December number of *Meehan's Monthly* contains a portrait of Sir Ferdinand von Mueller, Government Botanist of Victoria, Australia, with a sketch of his life. Baron Mueller is not only celebrated for his work on the botany of the great island-continent, but further for his generous distribution of specimens of Australian plants and plant-products to the botanists of the world.

BOTANISTS who have watched the rapid disappearance of the beautiful and interesting oak, *Quercus densiflora*, due to the axe of the tan-bark hunter will be glad to learn that the root of *Rumex hymenosepalus* is likely to come into greater favor as tanning material. It is said that one ton of the dock is equal in value to five tons of the oak-bark.

A CONSPECTUS of the genus Arenaria by F. N. Williams appears in the November number of *Bulletin de l'Herbier*

Boissier. The author sinks Dolophragma, Fenzl., and Brachystemma, Don, in Arenaria and bases the primary subdivisions of the genus on the association of two characters—the structure of the disk and the number of teeth formed by the dehiscence of the ripe capsule.

THE annual election of officers of the California Academy of Sciences was held January 6. David Starr Jordan succeeded Dr. Harkness who has been president for eight years. The other officers are as follows: First Vice-President, William E. Ritter; Second Vice-President, H. H. Behr; Corresponding Secretary, J. O'B. Gunn; Treasurer, L. H. Foote; Librarian, Chas. A. Keeler; Trustees, W. C. Burnett, W. S. Chapman, C. F. Crocker, W. S. Keyes, E. J. Molera, George C. Perkins, G. W. Stewart.

THE LIST of Insular "Floras" has received an interesting addition in Dr. Cordemoy's *Flore de l'Isle de la Réunion* [Bourbon]: Paris, 1895. Out of a total of less than 1000 Phanerogamia upwards of 200 are described as new. 172 species of Orchids and about 220 Lycopods and Ferns are enumerated, the Orchids more than doubling the number of any other order of flowering plants. Reviewing the book in the *Gardeners' Chronicle* of Dec. 21st Mr. Hemsley states that very few genera are peculiar to either Bourbon or Mauritius, but several are restricted to the two: peculiar species are very numerous on both islands.

AN inventory of the Herbarium of the California Academy of Sciences recently prepared indicates the following condition: number of mounted specimens, 45,234; unmounted specimens, 15,476; determined specimens, 60,638; undetermined specimens, 8,832. The number of specimens of Phænogamia is 52,949, the number of species, 19,586. The number of specimens of Cryptogamia is 7,689, the species numbering 2,838. There are about 3,500 genera represented. The total number of specimens in the Herbarium is 74,767.

Mr. Geo. Hansen of Jackson, California, has issued a volume on "Orchid Hybrids" which is an "enumeration and classification of all hybrids of orchids" published up to October 15, 1895. The book is dedicated to Dr. Maxwell T. Masters, Editor of the *Gardeners' Chronicle.* The contents include a review of the work accomplished and inferences for future work; the characters of the flowers of orchids; a list of the people who raise orchids; remarks respecting the genera and species employed in raising hybrids; synonymy; a key; and a list of hybrids. The author expects to issue supplements from time to time. The volume should certainly be of great interest to orchid-growers.

Dr. Ernst Stizenberger, the well-known lichenologist and a contributor to the pages of this journal, died in Konstanz, Germany, Sept. 27, 1895.

Dr. Francis P. Porcher, an able and well-known physician and botanist, died in Charleston, S. C., Nov. 20th. In the capacity of an army physician he held a high position with the Confederate government. His celebrated work on "Resources of the Southern Fields and Forests," published during the Civil War, was of immense practical service to the people of the South enabling them during the years of the blockade to utilize natural and cultivated products in the absence of all imports.

Mr. C. G. Lloyd has distributed No. 8 of his series of "Photogravures of American Fungi." This plate represents *Urnula craterium* and is equal in excellence to those previously issued.

Professor W. A. Setchell, of the Department of Botany of the University of California, devoted three weeks of December and January to an examination of the marine flora of the Southern Californian coast near San Pedro.

Professor D. H. Campbell published in December, under the title of "The Structure and Development of the Mosses and Ferns," the results of his investigations among the Archegoniatæ. A review of the work will appear in our March issue.

THE *Botanical Gazette* for December contains an article on "The Botanical Explorations of Thomas Coulter" by F. V. Coville. Coulter, who was the first botanist to cross the Colorado Desert, noted for its peculiar flora, was at Monterey in 1831-2. He there met David Douglas and the two botanized together during the winter. There has been much confusion concerning Coulter's plants, many collected east of the Colorado having been credited to California. The present paper is an attempt to determine the route of Coulter's journeys and the localities whence he derived his plants.

MR. B. DAYDON JACKSON is now assisting M. Th. Durand of the Royal Herbarium, Brussels, in the completion of his supplement to the *Index Kewensis*. This supplement is to cover the ten years to the end of 1895, a period of special importance in the annals of West American Botany, and its appearance will be awaited with eagerness by botanists on this side of the Atlantic. It is announced that arrangements are in progress for publishing the supplement uniformly with the *Index* itself, and that it may be issued sometime this year.

THROUGH the generosity of Dr. Thiselton-Dyer, Director of the Royal Gardens, Kew, the Botanic Garden of the University of California has received seeds of *Widdringtonia Whytei*, Rendle, which are now germinating freely in a cool greenhouse. This Conifer forms forests on the mountains of Nyasaland, South Africa, growing to the height of 140 feet. It is said to have Juniper-like leaves, and cones smaller than a chestnut. Out of seventeen seeds which have germinated at Berkeley, twelve developed three cotyledons, two have two only (which are broader than those of the other seedlings), and three have four cotyledons. Should the M'langi Cypress, as it is called, thrive in the climate of California, as seems likely from the vigorous state of the present batch of seedlings, it will prove a most interesting addition to our introduced trees.

NOTES ON KELPS.

By William Albert Setchell.

Among the wonders of the Californian flora, the gigantic brown seaweeds, generally known as kelps are by no means the least noticeable. But our knowledge of these plants and of their habits is far from being either complete or satisfactory and it is with much pleasure that the writer has availed himself of the privilege of studying in the field, as it were, those forms which had previously been known to him only through herbarium fragments.

Never yet, has there been published any connected account of the kelps of the Californian coast. Mertens the younger, Postels, Ruprecht, Harvey, Areschoug, and Farlow have contributed the main facts known to us and of these, as far as is known to the writer, only the first and last have had the privilege of seeing any of our forms in their native habitat.

The treatment, then, which our forms have received in the third volume of De Toni's "Sylloge Algarum" which has just been issued has an especial interest to the algologists of the western coast.

In the general arrangement of the genera and in the division into tribes, De Toni has followed very closely Kjellman's arrangement given in Engler and Prantl's "Die Natuerlichen Pflanzenfamilien (I Th., 2 Abth., pp. 253-254, 1893) with the result that within the same tribe we find genera of such diverse form and development as *Laminaria*, *Nereocystis*, and *Eisenia*. It certainly seems as if such modifications of the intercalary meristem as are found in the Lessonioid and Alarioid genera, ought to be considered as matters of phylogenetic significance and ought also to receive especial attention in any scheme of classification.

As far as the writer is able to ascertain, only one *Alaria* is reported with certainty from the coast of California and this is referred to *A. marginata* P. & R. It has been distributed under the name of *A. esculenta*, but the Californian species is certainly not the *A. esculenta* of the European and especially of the Scandinavian authors. Its midrib is

Erythea, Vol. IV., No. 3 [5 March, 1896].

broader and its cross section is not rectangular as is the case in *A. esculenta* of the European coast (cf. Kjellman, Algae of the Arctic Sea, Pl. 25, f. 19, 1883) and of the New England coast. In breadth, and in cross section of midrib, the Californian form closely resembles the *A. laticosta* Kjellm. of Behring Sea but the sporophylls are broader and distinctly margined.

Alaria fistulosa P. & R. is a very large species, the largest in the genus, characterized by its broad swollen midrib, constricted at intervals. This species is characteristic of Behring Sea and fragments of the blade 20 to 30 feet long are brought from there in collections. De Toni quotes Dr. C. L. Anderson as authority for the occurrence of this northern species on the Californian coast. A fragment supposed to be of this species was collected at the Farallones Islands by Mr. Blankinship (cf. Zoe, 3; 148, 1892) but Dr. Anderson writes that the specimens of algae were in poor condition when they reached him and the writer is unable to find that any specimen of this species was preserved. The occurrence of this species at the Farallones, if confirmed, will be an interesting fact in the geographical distribution of the Arctic species.

Under *Pterygophora Californica* Rupr., De Toni has quoted Areschoug in giving "Vera Cruz, California" instead of Santa Cruz and he has done the same thing under *Eisenia arborea* Aresch., *Postelsia palmaeformis* Rupr., and *Laminaria Andersonii* Farlow.

Eisenia arborea Aresch. is said by its namer to have been found at San Francisco by Dr. Gustave Eisen. Dr. Eisen however kindly informs me that it was collected by him at Santa Catalina. Dr. Anderson finds it at Santa Cruz in company with *Nereocystis gigantea* Aresch., blown in from the South after southerly winter storms but never growing in the neighborhood. It is, therefore, a decidedly southern species having been found also at San Diego by Mr. Cleveland and Professor Eigenmann and by the writer, growing in great abundance just below low water mark at Redondo and San Pedro during the last Christmas holidays. Almost all stages of growth were represented in the writer's collections.

The smallest fronds found are about two inches long with ovate-lanceolate blades, short cylindrical stipes, and holdfasts of three or four simple hapteres. The blades in these specimens are entire at their bases and possess one or two coarse transverse wrinkles. Specimens a little larger show small outgrowths appearing on the very base of the blade and these become long lateral lobes or prolongations of the blade in older specimens, making the blade decidedly pinnate.

In still larger specimens (10-14 inches long) the basal margins bearing the prolongations, become involute and thickened, forming two scroll-like growths at the base. As the basal margins thicken, the terminal blade wears away down to these thickened portions leaving them projecting like two arms from the tip of the stipe and bearing the prolongations or sporophylls at the summits. The largest specimen collected possessed a stipe about three feet long, the arms were each about 18 inches long, and the sporophylls reached a length of somewhat over a foot.

Some of the fronds retain a considerable portion of the blade for a long time and then resemble very closely some species of *Ecklonia* from which however they may be distinguished by the involutions at the base of the blade. It seems probable that the *Ecklonia radiata* referred to this coast (cf. Areschoug, Obs. Phyc., Part. 5, p. 12, 1884) may have been one of these young plants of *Eisenia.*

Egregia Menziesii (Turn.) Aresch., as generally understood, is common along the whole coast and presents a number of very distinct and puzzling forms. The more northern form, common about San Francisco, has the flattened axis (rhachis) covered with short, linear, thickish projections whose long axes are parallel to the axis of the plant. These appear also upon the terminal blade but not upon the sporophylls. The southern form which is plentiful about San Pedro, has the rhachis and terminal blade perfectly smooth. The leaflets in this form vary from simple and obovate to very much pinnately dissected, the divisions finally becoming long and bristle-shaped. Both shapes of sporophylls occur upon the same plants, the more dissected ones being borne upon the older portions of the rhachis. Both the smooth and the rough forms have been found at Port Harford by the writer and by Dr. Anderson at Santa Cruz, but the smooth form is not so well developed as it is below Point Conception. Careful search about San Pedro failed to discover any trace of the rough form and no smooth forms have been found by the writer about San Francisco, although Egregias are abundant in both localities.

The rough variety is the one figured and described by Ruprecht (Mem. Acad. St. Petersb., 7; 71, Pl. 4; 1852) and described by J. G. Agardh (Species Algarum, 1; 254, 1848, under *Phyllospora Menziesii* and *P. Chamissoi*), and seems also to have been the one originally described by Turner (Hist. Fucorum, Pl. 27, 1808) for he says "rough all over both to the touch and sight with minute black tubercles." It consequently seems best to the writer to distinguish the smooth form as a separate species under the name of **Egregia lævigata**, distinguished from *E. Menziesii* by its smooth rhachis and by its sporophylls varying from simple and entire to pinnately decompound, with bristle-shaped divisions. The writer hopes to publish a more detailed account of these two species and their variations at some future time.

Macrocystis pyrifera (Turn.) Ag., the "great-kelp" of the Californian coast, is very variable indeed but most writers agree with Hooker in recognizing but one species. Areschoug, however, recognizes a second species from the coasts of Chile and Peru, the *M. angustifolia* Bory (Obs. Phyc., Part. 4, p. 22, 1883), distinguished by its creeping rhizome from which both roots and stems are given off. The writer finds on examining the roots of the common Californian species, that the older specimens possess rhizomes of considerable length which give rise to both stems and roots and it may be that even this character may be common to all older specimens of *Macrocystis*.

Laminaria Sinclairii (Harv.) Farlow was first published in connection with the specimen but without description in Farlow, Eaton, and Anderson's Algæ Exsiccatæ Americæ Borealis (Fasc. 3, No. 118, 1878) where the *Lessonia Sinclairii* Harv. is quoted as a synonym. This name used by

Harvey in Hooker's Flora Antarctica (2; 460, 1847) and again in the Nereis Boreali-Americana (Part 1; 87, 1858), where Harvey says that the species must remain without a description, is the *Laminaria saccharina* of Harvey in Hooker and Arnott's Botany of Beechey's Voyage (p. 407, 1841). De Toni, however, places the *Lessonia Sinclairii* Harv. among the "species inquirendae" quoting the reference to it from J. G. Agardh (Species Alg., 1; 152, 1848).

Laminaria Sinclairii is very common about San Francisco, extends north into Behring Sea (Kyska and Agattu Islands) and southward as far as Monterey where it is still common. The writer failed to find it growing at Port Harford in a hasty trip about the shores on Jan. 11, 1896, although several specimens were found thrown ashore. Very careful search failed to discover it about San Pedro or Redondo either growing or cast ashore and Mr. Cleveland does not report it from San Diego. It must be classed for the present at least with those species whose southern limit is north of Point Conception.

Laminaria Sinclairii shows certain peculiar phenomena at the time of the renewing of the blade, which may perhaps, when they are carefully investigated, throw considerable light upon this peculiarity in the other species of the genus *Laminaria*. Dr. Anderson and the writer have noticed for several years the existence of certain peculiar "collars" at the tips of the stipes into which the blades seemed to fit. Areschoug must have noticed them too for he says; "Folium basi a trunco quasi vaginatum" (Obs. Phyc., Part 4; 6, 1883)

At certain times these collars are very noticeable projecting up around the base of the blade for about a quarter of an inch. As the stipe increases in length by new growth at its apex the collars are left behind and gradually wear away. From specimens collected at Fort Point, San Francisco by the writer, in December 1895, it is shown that after the resting period, during which the reproductive organs are formed, is finished, there comes into being a renewed activity of the meristematic tissues at the "transition-place" between tipe and blade. Furthermore, it is shown that this meristematic activity does not extend to the outer tissues of the cortex (several layers of cells) and that these outer layers are ruptured transversely and split away longitudinally from the elongating inner tissue leaving an inconspicuous scar at the base of the blade and a more conspicuous one at the top of the stipe.

The writer has noticed that essentially the same thing happens in *L. Farlowii* Setchell and *L. platymeris* De la Pyl. and hopes to describe the phenomenon in detail before long.

Laminaria Farlowii Setchell occurs in abundance at San Pedro and at Monterey according to Dr. Anderson. It is not common about San Francisco. De Toni says that this species is known to him only as a manuscript name in Dr. Anderson's List of the Marine Algae of California (Zoe, 2; 220, 1891). It was described by the writer in 1893 (cf. Proc. Conn. Acad., 9; 355) in his paper "On the Classification and Geographical Distribution of the Laminariaceæ," a reprint of which was sent to the management of "La Nuova Notarisia" and acknowledged (ser. iv. p. 402, 1893).

Thalassiophyllum Clathrus (Gmel.) P. & R. is a Behring Sea species whose occurrence on the Californian coast has not been, so far as the writer knows, certainly recorded. De Toni gives California in the list of localities and cites Dr. Anderson as authority but the only reference is to Dr. Anderson's "List" and in that the note appended to the species reads: "probably in California" (cf. Zoe. 2; 220, 1891)

Costaria reticulata Saunders was described from the coast of California in the Botanical Gazette for 1895 (20; 54-58, Pl. 7) having been obtained at Monterey. The plant differs from the other Costarias, of which two were recognized in the paper, by having a single broader or narrower "midrib" (the rest of the blade being reticulated) instead of the three to five narrow longitudinal ribs which the characters of the genus *Costaria* require. Such a *Costaria* as this is certainly very anomalous and requires that the original conception of the genus should be very much modified in order to include it. De Toni (loc. cit.; 362) refers to the plant doubtfully under *Costaria* and says that it recalls *Dictyoneuron Californicum* Rupr.

Through the kindness of Mr. Saunders, the writer has been able to examine an authentic specimen of this plant, and through the kindness of Dr. Anderson he has obtained also several specimens more, and as a result of careful study and investigation feels sure that it cannot be separated generically from *Dictyoneuron*. The reticulations on the blade, the short, thick stipe with lateral branched rootlets point unmistakably toward *Dictyoneuron*. Furthermore there is a specimen in the University Herbarium at Berkeley, collected by Mr. M. A. Howe at Pacific Grove in July, 1892, (cf. Pl. I) with reticulations and a partial " midrib," which is beginning to split longitudinally at the base, showing it to be a true *Dictyoneuron*. Several of Dr. Anderson's specimens, also provided with undoubted "midribs," have their blades borne upon dichotomously branched stipes and give additional evidence that the *Costaria reticulata* is a *Dictyoneuron*.

But no species of *Dictyoneuron* has been described as having a midrib such as is credited to *Costaria reticulata*. An examination of Mr. Saunder's specimen shows, however, that this middle structure is not a real rib. It is described as varying in width from a little over a quarter of an inch to two inches and as being about "twice the thickness of the body of the plant." The varying width is well illustrated by the specimens in the writer's possession, but he does not find the thickness as represented. In the middle of the so-called midrib of Mr. Saunder's specimen the thickness is that of the ordinary unmodified portions of the frond but at the edges it is thicker and the writer finds that the "midrib" is simply a central portion of the blade, free from reticulations, between two prominent longitudinal ribs, such as are not uncommon in specimens of *Dictyoneuron Californicum*. For on examining a number of specimens of *D. Californicum* this central space between two longitudinal ribs is often found and sometimes it is perfectly plane, sometimes reticulated, and sometimes plane below and reticulated above (cf. Pl. I). Ruprecht says in his original diagnosis (loc. cit.; 80); "nervo longitudinali (interdum duplici) folium usque ad apicem permeante."

This character, then, striking as it is in some specimens, does not seem to be either constant or characteristic and

Costaria reticulata Saunders becomes simply a not uncommon form of *Dictyoneuron Californicum* Rupr.

PLATE I. A specimen of *Dictyoneuron Californicum* Rupr. collected at Pacific Grove, Calif., July, 1892, by Mr. M. A. Howe showing two longitudinal central ribs, the space between being somewhat reticulated above but almost plane below. The specimen also is beginning to split at the base. (From a photograph, ½ nat. size).

NOTES ON CALIFORNIAN BRYOPHYTES.—II.

By MARSHALL A. HOWE.

Of the plants listed below, one—*Cephalozia Turneri*—is new to America, several have not before been reported as occurring in California, and the others are thought to be of sufficient interest to justify placing on record localities where they have been collected

HEPATICÆ.

Riccia Californica, Aust. On shaded bank beside the Botanic Garden of the University of California, with *R. glauca*, L.; Fruit Vale, Alameda Co., Miss Edith S. Byxbee.

Riccia lamellosa, Raddi. Fruit Vale, Miss Byxbee. There is also a specimen in the Herbarium of the California Academy of Sciences from near the Golden Gate Park, San Francisco, mixed with *Riccia hirta*, Aust. and *R. nigrella*, DC. In both specimens, the spore-measurements are larger than those given by Underwood,[1] the average diameter being 110-115μ.

Lunularia vulgaris, Mich. In greenhouses, Berkeley and San Francisco.

Reboulia hemisphærica (L.) Raddi. Folsom, Mrs. Brandegee. In Herb. Cal. Acad.

Cryptomitrium tenerum (Hook.) Aust. Menlo Park, Mr. W. C. Blasdale; Folsom, Mrs. Brandegee; Jackson. Amador Co., Mr. George Hansen; Navarro, Mendocino Co., Miss Byxbee; also at Fruit Vale. The specimens from all the localities cited agree in showing no trace of costæ in the carpocephalum. In specimens collected by Prof. McClatchie at Pasadena the costæ are sometimes quite evident.

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[1] Systematic Botany of North America, Vol. IX, Part I, p. 6.

Conocephalus conicus (L.) Dumort. On stones in creek-beds near Lake Pilarcitos, San Mateo Co. Sterile. Also collected in the Santa Cruz Mts. by Prof. L. M. Underwood.

Aneura latifrons, Lindb. On log by stream, Sisson, Siskiyou Co.; Redwood Cañon, near Mill Valley, Marin Co.; Navarro, Mendocino Co., Miss Byxbee.

Aneura palmata (Hall.) Dumort. Growing with the former at Sisson. Agrees perfectly with Lindberg's description.[2]

Nardia crenulata (Sm.) Lindb. On roadside bank near Lake San Andreas, San Mateo Co.

Marsupella emarginata (Ehrh.) Dumort. On banks, Lake San Andreas; also in Marin Co.

Jungermannia incisa, Schrad. On log by stream, Sisson.

Jungermannia ventricosa, Dicks. On decaying wood, Sisson.

Chiloscyphus polyanthos (L.) Corda, var. *rivularis*, Nees, Forming extended mats on stones permanently submerged. Sisson and Shasta Springs; Navarro, Miss Byxbee; Lassen Co., M. S. Baker and F. P. Nutting.

Lophocolea heterophylla (Schrad.) Dumort. On old log, Olema, Marin Co. In company with another *Lophocolea* which seems to be the same as *L. Leibergii*, Underw. & Cook (No. 70, Hep. Am.), though not yet determined with certainty.

Scapania nemorosa (L.) Dumort. On rocks, slopes of Mt. Tamalpais, Marin Co.; on moist bank, Lake San Andreas; Del Norte Co., Thomas Howell.

Scapania undulata (L.) Dumort. Abundant on stones in the river at Sisson, forming erect compact tufts. With *Chiloscyphus polyanthos*, var. *rivularis*.

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[2] Manipulus Muscorum Secundus, p. 375.

Kantia Trichomanis (L.) S. F. Gray, var. *Sprengelii*, (Nees.). Mill Valley and Olema. Also the propaguliferous form.

Cephalozia bicuspidata (L.) Dumort. Olema, Sisson, and other places.

Cephalozia pleniceps (Aust.) Underw. On bank of stream, Sisson. Determination based on Austin's description and on Spruce's detailed diagnosis of *C. crassiflora*, which Pearson[3] considers the same.

Cephalozia divaricata (Sm.) Dumort. On charred redwood stumps and on ground, Mill Valley, and on rocks near Lake Lagunitas, Marin Co.

Cephalozia Turneri (Hook.) Spruce. On roadside banks in various parts of Mill Valley, Marin Co., and also near Lake San Andreas in San Mateo Co. Not before reported for America. The occurrence of this very rare Old-World hepatic in California is a matter of much interest. It has been found in a few localities in Ireland, England, and France, in the Canary Isles, and there is one known station for it in northern Africa. Through the kindness of Matthew B. Slater, Esq., of Malton, England, I was enabled to make comparisons with an English (sterile) specimen. The inmost involucral leaves are highly connate as in a form to which Spruce refers (On Cephalozia, p. 72) as having been collected in Ireland by Lindberg.

Blepharostoma trichophyllum (L.) Dumort. With an undetermined *Jungermannia*. Fish Creek, Mariposa Co., Miss Byxbee.

Lepidozia reptans (L.) Dumort. On old logs, Sisson, and in Redwood Cañon near Mill Valley.

Radula complanata (L.) Dumort. Rarely found on trunks of trees in Strawberry Cañon, Berkeley (leaf margins gemmiferous); more abundant in Bear Valley near Olema.

MUSCI.

Acaulon muticum (Schreb.) C. Muell. On roadside near the "Old Mill," Mill Valley.

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[3] P. 9, List of Canadian Hepaticæ in Macoun's Catalogue of Canadian Plants.

Dicranella Howei, Ren & Card. (*Revue Bryologique*, 1893, p. 30). On moist banks, Mt. Tamalpais and various other parts of Marin Co.; Berkeley; Napa Co., Mr. W. L. Jepson.

Dicranum Howelli, Ren. & Card. On shaded stones, Shasta Springs. Determination based on description and figures published by the authors in the *Botanical Gazette.*

Dicranum strictum, Schleich. On logs, Sisson and Shasta Springs.

Fissidens grandifrons, Brid. On wet rocks, Mt. Tamalpais; on stones in river, Sisson and Shasta Springs.

Pottia Starkeana (Hedw.) C. Muell. University Grounds, Berkeley.

Tortula Bolanderi (Lesq.) Specimens collected at Berkeley and in Marin Co., apparently referable to this species differ from the Manual description in that the costa of the leaf usually vanishes at the rounded apex.

Tortula muralis (L.) Hedw. On stones, Berkeley.

Scouleria marginata, E. G. Britton. On rocks just above the water, Sacramento River, Sims, Shasta Co. Our specimen of No. 202, Musci Leibergiani, contains this species together with *S. aquatica.*

Grimmia apocarpa (L.) Hedw. On rocks by Sacramento River at Shasta Springs, together with the variety *rivularis* (Brid.) W. M. The typical form also in the Dixey Mts., Lassen Co., Baker & Nutting.

Grimmia heterosticha (Hedw.) C. Muell. Common on rocks, Shasta Springs.

Grimmia Nevii, C. Muell. On rocks near the water-line of Sacramento River, Shasta Springs. Differs from specimen collected by Nevius (in the Herbarium of Columbia College) in scarcely anything but darker color and little larger and longer capsule.

Ptychomitrium Gardneri, Lesq. On stones, "Wildcat Cañon," near Berkeley.

Orthotrichum consimile, Mitt. On trees, Olema.

Orthotrichum pulchellum, Brunt. On trees in company with the preceding.

Orthotrichum rivulare, Turn. On rocks near water-line of Sacramento River, Shasta Springs; Sonoma Co., Mr. F. T. Bioletti.

Funaria convoluta, Hampe. Near Fresno, Mr. Frank P. Nutting.

Funaria Muehlenbergii, Turn. On banks, Berkeley; Bear Valley, near Olema.

Philonotis capillaris, Lindb. On moist bank, near Lake San Andreas, San Mateo Co.

Meesia triquetra (L.). Angstr. In bogs, Sisson.

Meesia uliginosa, Hedw. In swamp, Sisson.

Pohlia cruda (L.) Lindb. In crevices of rocks, Shasta Springs.

Bryum Atwateriæ, C. Muell. Patton's Peak, Sonoma Co., Mr. F. T. Bioletti.

Bryum crassirameum, Ren. & Card. Mill Valley and Olema. Determination based on the authors' description and figures.

Bryum Hendersonii, Ren. & Card. On moist rocks, Mill Valley. Determined by Mons. Jules Cardot.

Bryum sanguilentum, Ren. & Card. (*Revue Bryologique*, 1893, p. 31). On old redwood stumps, Mill Valley. Intergrades with undoubted *B. capillare*, L.

Bryum torquescens, Br. Sch. Tocaloma, Marin Co.

Fontinalis Neo-Mexicana, Sulliv. & Lesq. In Sacramento River at Sisson and Shasta Springs.

Pterigynandrum filiforme, Hedw. On log in woods, Sisson.

Fabronia pusilla, Raddi. On bark of *Quercus agrifolia*. Grounds of the University of California.

Pseudoleskea rigescens (Wils.) Lindb. On rocks, base of Mt. Shasta, alt. about 4500 ft. Same as Roell's No. 919 according to specimen seen in the Columbia College Herbarium. Also agrees well with Drummond's No. 225 (*Hypnum tenax*) in the Columbia College set.

Claopodium leuconeurum (Sulliv. & Lesq.) Ren. & Card. Common on shaded ground in the Coast Range Mts. The cilia are variable—from one to three in number and often as long as the segments.

Camptothecium arenarium (Lesq.) Ren. & Card. On the Berkeley Hills; on dry soil, cañon-sides, Pasadena, Prof. A. J. McClatchie.

Camptothecium dolosum, Ren. & Card., *forma*. On shaded rocks, Shasta Springs. Compared with authentic specimen kindly communicated by Mons. Cardot.

Camptothecium lutescens (Huds.) Br. Sch., var. *occidentale*, Ren. & Card. On log by stream, Sisson.

Camptothecinm Nevadense (Lesq.) Mac. & Kindb. On shaded rocks, Shasta Springs. Short cilia are present and the capsule is noticeably arcuate. The plant seems more at home under Camptothecium, where originally placed, than under Homalothecium, to which it has been transferred by Renauld and Cardot.[4]

Camptothecium pinnatifidum (Sulliv. & Lesq.) Ren. & Card. On ground about rocks, Wildcat Cañon, near Berkeley; Sonoma, Mr. F. T. Bioletti.

Brachythecium albicans (Neck.) Br. Sch. On rocks in woods, Shasta Springs. Sporogonia present.

Brachythecium Bolanderi (Lesq.) Ren. & Card. Olema.

Brachythecium collinum (Schleich.) Br. Sch. On rocks, base of Mt. Shasta, alt. about 4500 ft. With sporogonia.

Brachythecium laetum (Brid.) Br. Sch., var. *fallax*, Ren. & Card. On bank of railway cut near Valencia St. Station, San Francisco. Determined by J. Cardot.

Scleropodium Californicum (Lesq.) Ren. & Card. With the preceding.

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[4] Botanical Gazette, Vol. XIII, p. 202.

Scleropodium obtusifolium (Drumm.) Mac. & Kindb. On shaded banks and on rocks in or near running water. Wildcat Cañon; Sisson; Shasta Springs; Loma Prieta, Santa Clara Co., Mr. J. Burtt Davy.

Isothecium Howei, Kindb. (*Revue Bryologique*, 1895, p. 82). This is one of many forms intermediate between *Isothecium Brewerianum* (Lesq.) and *Isothecium myosuroides* (L.) Brid., var. *stoloniferum* (Hook), with the more points of correspondence with the former. It was collected on beams of the "Old Mill," in Mill Valley.

Thamnium Holzingeri. Ren. & Card. At base of *Umbellularia* trees and on fallen trunks of the same at Olema Dioicous; cilia commonly single with sometimes a second imperfect one; annulus compound.

Plagiothecium denticulatum (L.) Br. Sch. On rotten wood, Olema.

Amblystegium compactum (C. Muell.) Br. Sch. On moist rocks, Shasta Springs.

Hypnum Sendtneri, Sch., forma *vulgaris*, Sanio. Abundant on very wet adobe flats, Forestdale, Modoc Co., M. S. Baker and F. P. Nutting. Determined by the eminent authority on the Harpidium group—Mons. F. Renauld.

Limnobium palustre (L.) Br. Sch. On rocks wet by spray of Mossbrae Falls, Shasta Springs.

SOME CALIFORNIAN SPECIES OF PHACELIA.

By Edward L. Greene.

Phacelia virgata. Biennial, very stout, strictly erect, 2 or 3 feet high, leafy at base, and to the middle of the stem, thence compactly virgate-racemose to the summit: stem with a sparse almost hispid coarse pubescence, and underneath this a dense almost plush-like short indument: leaves pinnately divided, the lowest with about three pairs of pinnæ, a third the size of the terminal elliptic-lanceolate segment, this 2 inches long or more; pubescence of all the leaves appressed: corolla small, campanulate, dull yellowish, subpersistent: lobes of fruiting calyx very narrowly elliptic-lanceolate, sparingly hispid, and with a distinct midvein as well as equally prominent short transverse veinlets: capsule small, broadly ovate, acute, strigose-hispidulous and slightly pubescent, 2-seeded: seeds red-brown, ovate-lanceolate, deeply favose.

Var. **ampliata.** Less robust, seldom 2 feet high, and with several basal branches half as tall as the main stem and equally floriferous almost throughout, the numerous racemes more slender and less virgately arranged: lowest leaves occasionally simple, or with few pinnæ; the pubescence of these shorter, denser and more canescent.

Var. (?) **Bernardina.** Strict and simple like the type, but basal leaves and lower part of stem very hispid with somewhat deflexed hairs, the shorter and softer pubescence scanty or wanting: calyx segments larger and ampler, oblanceolate, obtusish, hispid-ciliate, scarcely veiny.

The type of this species is a common plant of northern California and adjacent Oregon, and is well illustrated in my number 832 of the collection of 1876. It ranges southward, along the eastern foothills of the Sierra Nevada well toward Donner Lake; but further eastward, as in the Washoe Mountains, it takes on the remarkable form described as var. *ampliata.* I doubt if either this variety or the type may prove to have any geographic or genetic connection with the plant of similar habit, which Mr. Parish finds near San Bernardino. This is more likely to prove quite distinct. None of these have any close relationship with the Patagonian "*P. circinata,*" to which they have been, referred; and the same remark applies equally to the next namely:

P. mutabilis. Biennial, erect, slender, 10 to 18 inches high, not much branched, sparingly leafy, the radical leaves few and ascending, not forming a depressed tuft, sparsely hirsute throughout, and with a short somewhat villous pubescence underneath the hirsute: leaves of thin texture, mostly entire and simple, elliptic, acute, some of the radical with a pair of pinnæ at summit of the slender petiole: racemes several, terminal and subterminal: corolla nearly cylindrical, either deep purple or ochroleucous: mature calyx-segments narrowly oblanceolate, or some of them more dilated at summit, hispid with spreading hairs, without finer pubescence: capsule small, ovate, acuminate, mostly 4-seeded.

Plant of higher altitudes than the preceding, growing in richer and moister soil; common towards Castle Peak, and southward to at least Alpine Co., also northward to the borders of Oregon; seldom or never passing to the westward slope of the Sierra. Its nearest ally is *P. nemoralis* of the Coast Range, to which species I formerly referred it, and which also, like this, is purple-flowered in some localities, yellowish-flowered in others. In both cases the stamens and style are so excessively elongated as to prevent the falling away of the corolla, by becoming entangled in a loose knot above its orifice.

PHYTOGRAPHIC NOTES AND AMENDMENTS.—III.

By Edward L. Greene.

At page 17 of Erythea for 1895 was published a species of vetch (*Vicia semicincta;* this changed by the compositor, even after the last proofs had been read, into "*semicinecta*") from one of the remotest corners of Oregon, which, in default of the flowers seemed to approach the very large *V. gigantea* of the Pacific seaboard. I had not a doubt of its being other than new. The locality whence it had come was unsettled, almost, and botanically quite new to exploration. The collector had recorded nothing as to the special habitat of the plant, nor any suspicion that it was not indigenous there. She has this last season obtained the much desired flowering specimens, and has sent these also without any intimation that they occur in other than wild land. Yet in these flowering specimens I recognize at first glance one of the common vetches of the Old World, *i. e.*, *Vicia Cracca*.

ERIGERON CONFINIS, Howell, Eryth. iii, 35, a fine species, has, through my own forgetfulness, a synonym in *E. Blasdalei*, published in the same volume, at page 124. The specimens obtained last year by Mr. Blasdale are of three times the size of the Siskiyou specimens on which Mr. Howell based the species; but there is a perfect agreement between the two in all essential characters. The species is a beautiful one, and probably rare; some four hundred and fifty miles intervening between the two stations that are now recorded for it.

Ribes Howellii, as a name, may well replace the *R. acerifolium* of Howell, ERYTH. iii, 34. There is a much earlier *R. acerifolium* of C. Koch.

POLYGONUM BICORNE, Raf. Fl. Ludov. 29 (1817). *P. longistylum*, Small, Bull. Torr. Club. xxi. 169 (1894), and Monogr. 62, t. 18 (1895). The prominent characteristics of this excellent *Persicaria* are so striking that no botanist can well be supposed to have overlooked them. The extremely long forked style, with its branches upright and gradually divergent, like a pair of horns (instead of being recurved or deflexed as in nearly all closely allied species) were as clearly emphasized by Rafinesque as by Mr. Small; and each author allowed this remarkable pistil to suggest a specific name. It seems to me that the botanist last named must have been unaware of the fact that a number of these plants of the lower Mississippi had been named and defined in the *Flora Ludoviciana*. Nor are the descriptions in any case to be complained of as too short. They are even rather more full than the most eminent botanists in the early decades of this century were in the habit of giving. Very likely Mr. Small could tell us, after due examination of the text, with the polygonums of that region before him for comparison, what Rafinesque had in view as his *P. maculatum*, and *P. pachyum* of his work on southwestern botany. Certainly as to the absolute identity of his *P. longistylum* and the earlier *P.*

bicorne there can be no room for two opinions. The original description, covering almost half a page, is answered to in every particular, by the plant whose salient features are so well shown in Mr. Small's plate 18.

GILIA CAPILLARIS, Kell. Proc. Calif. Acad. v. 46 (1873). Very glandular and somewhat viscid throughout; branches rather short and ascending, the panicle not effuse; corolla white or pale purplish, barely 2 lines long and only about twice the length of the calyx, the proper tube not surpassing the calyx-teeth: style short, the stigmas not exserted.

Gilia leptalea. *Collomia leptalea*, Gray, Proc. Am. Acad. viii, 261 (1870), chiefly. Less glandular, often quite glabrous: less leafy and the leaves narrower: branches more slender and divergent, the panicle therefore truly effuse: corolla fully ½ inch long, of a deep rich red-purple; the slender tube twice the length of the calyx, this widening into an ample funnelform throat which is nearly as long as the proper tube: style elongated, the stigmas borne beyond the corolla-lobes.

Thus are given the essential characters of two perfectly distinct species belonging to the middle and higher Sierra Nevada of California; one an insignificant weed, the other a very beautiful plant.

REVIEWS AND CRITICISMS.

The Structure and Development of the Mosses and Ferns. By DOUGLAS HOUGHTON CAMPBELL, Ph. D., Professor of Botany in the Leland Stanford Junior University. (Macmillan & Co., 544 pp. 8vo., price $4.50 net.)

The Pacific Coast of the United States is to be congratulated that a work of the importance and certain influence of the present volume has been sent forth from its borders. Professor Campbell has been for several years a well-known student of morphology and embryology of the archegoniate plants and many original articles have been given to the world as the results of his special studies. Finally he has given to us in very convenient form the selected fruits of his labors; both in carefully prepared discussions of the work of others and in the light thrown upon the various problems, by his own investigations.

It does not need a careful study of the volume to realize that we have now for the first time a complete summary and discussion of what is known of the morphology and physiology of the mosses, hepaticae, ferns and fern allies, as well as suggestive discussions of the significance of the various details, both as regards classification and phylogeny

It is of especial interest, too, that the illustrations are to a considerable extent drawn from the native and characteristic species of California. Professor Campbell has found in them an unworked and peculiarly valuable field and it has widened the influence and value of the book that in this way, it has given to the student of this subject a large number of original morphological and embryological facts about rare species, to be compared with those derived from the more familiar species of Europe and the eastern United States, a fact of the greatest importance in yielding a broader basis than has ever been available hitherto for the discussion of phylogenetic relationships.

The frequent discussion of the theories of the descent of special groups and of broader assemblages is one of the things which will make the book a welcome one and the new views expressed or theories proposed will yield a fresh harvest for the investigator.

The illustrations are mostly new and have not been burdened with unnecessary details but have been made with especial reference to the point to be emphasized and are a boon to all those who have hitherto seen the same figures brought forward in text-book after text-book.—W. A. S.

New or critical Lithothamnia. By M. FOSLIE. *Det kgl. norske Videnskabers Selskabs Skrifter*, 1895. (reprint, pp. 9, Pl. 1.)

One finds on the seashore, lining the pools or caves, hard stony crusts which are usually of some shade of pink. They are usually taken for corals by the uninitiated, especially when they rise into lobulated or branched forms. They are, however, usually seaweeds of the red group, belonging to the genus *Lithothamnion*. Two species of *Lithothamnion*, *L. polymorphum* and *L. Lenormandi* have been credited to our coast. But M. Foslie, in revising the species of the genus and subjecting them to critical study has found that these older names have been used by various authors to include a number of well defined forms, and all the specimens from any given locality must be worked over anew. In this small paper before us, which follows his larger one on the Norwegian forms, he describes two new species from California, *L. pallescens* Foslie, and *L. elegans* Foslie, and credits our coast with three more, *L. crassum* Phil., *L. dentatum* (Kuetz.) Aresch., and L. *coralloides* Cr. *L. magellanicum* from the Straits of Magellan is another new species which may yet be found on our coast. The specimens were communicated by Mr. P. Hariot of Paris.

Excellent figures from photographs accompany the article.—W. A. S.

SHORT ARTICLES.

CHAMISSO BOTANICAL CLUB:—Mr. Marshall A. Howe presented a paper at the regular meeting held February 20th on "A Comparison of the Hepatic flora of the Eastern United States and of Europe." The following interesting table showing the comparative distribution of species was given, which shows that our Hepatic Flora is much more closely related to that of the British Islands and Central and Northern Europe than it is to that of the region comprised within the limits of Gray's *Manual.*

California, total - - - - -	70	species	
In common with Gray's *Manual* Region	32	"	(46%)
" " " British Islands - -	31	"	(44%)
" " " Central and Northern Europe	36	"	(51%)
" " " Mediterranean region	37	"	(53%)
Peculiar to the Pacific Coast - -	22	"	(31%)

Gray's *Manual* region, total	145	species	
In common with California	32	"	(22%)
" " " British Islands	78	"	(54%)
" " " Central and Northern Europe	91	"	(63%)
" " " Mediterranean region	78	"	(54%)
Peculiar to Gray's *Manual* region	40	"	(28%)

MISCELLANEOUS NOTES AND NEWS.

SEVERAL new species and varieties of Carex from the Pacific Coast are described by Prof. L. H. Bailey in the *Botanical Gazette* for January: *Carex Hassei* from the San Bernardino Range; *C. Idahoa* from Beaver Canon, Idaho; *C. Congdoni* from Tuolomne and Mono counties, California; *C. quadrifida* Bailey, var. *caeca* from San Jacinto Mountains, San Diego Co.; *Carex Nebraskensis* Dewey, var. *ultriformis* from Ritzville, Washington; *Carex feta* Bailey, var. *multa* from the San Jacinto Mountains, San Diego Co., and from Oregon. In the same number Prof. D. H. Campbell describes a new Californian liverwort, *Geothallus tuberosus*, from San Diego.

THE London *Journal of Botany* has increased its monthly issue sixteen pages and its subscription price to sixteen shillings. This enlargement "will give scope to various branches of botany hitherto somewhat neglected." A review of Dr. D. Prain's "Revision of the Genus Argemone," concluded in the December number, will appear in our next issue.

WITH THE December number the *Botanical Gazette* completed its twentieth volume. In the prospectus for 1896 published in the January number we find the following: "Starting as a small publication twenty years ago, the journal now makes an annual volume more than two and a half inches thick when bound [!] and weighing over four pounds." [!] An increase in the weight of the paper might readily have made the thickness of the volume five inches instead of two and a half. However, the *Gazette* is much too estimable a journal to measure its worth by avoirdupois.

ON the authority of M. Henry L. de Vilmorin it is stated that a seed-producing hybrid between *Papaver bracteatum* and one of the double-flowered varieties of *P. somniferum*, the Opium-poppy, has been raised at Verrieres, France. "The seedlings were annuals, and bore single carmine-colored flowers. At first the plants were nearly all sterile but subsequently seed was freely produced."

IN "Ecologæ Botanicæ" No. 2 from the Proceedings of the Philadelphia Academy (1895, 546-54), Prof. E. L. Greene presents a "Revision of the Genus Tropidocarpum" and the following new species from California: *Trifolium truncatum* (*Trifolium Franciscanum* var. *truncatum* Greene) middle California inland; *T. lilacinum*, South San Francisco; *T. rostratum*, Lake Merritt, Oakland; *Valerianella magna*, Knight's Valley, Sonoma Co; *V. ciliosa*, Napa Valley; *Lessingia pectinata*, Monterey; *Vagnera pallescens*, middle elevations of the California Sierra. The following are from other western states: *Boisduvalia diffusa*, Humboldt River, Nevada; *Pyrrocoma eriopoda*, Soda Spring, Esmeralda Co., Nevada; *P. solidaginea*, Palisade, Nevada; *P. subviscosa*, Humboldt Wells, eastern Nevada; *Aster militaris*, Grants Pass, Oregon; *A. amplissimus*, toward limit of trees, Mt. Rainer; *A. frondeus* (*A*, *foliaceus*, var. *frondeus* Gray, in part).

A REVISION of Lester F. Ward's "Flora of Washington and Vicinity" published in 1881 is in course of preparation. Professor Ward will contribute the chapters dealing with the geology of the District, the fossil flora of the Potomac formation and the problems of geographical distribution. Various orders will be prepared by specialists and the manuscript of the volume will be edited by Charles Louis Pollard of the Division of Botany.

"I DID not mix after 1893 in the United States botanists' quarrels over nomenclature, considering them as home quarrels."—Dr. Otto Kuntze, San Remo, Italy, in *Botanical Gazette* for February. It may be noted also that the Editor of the London *Journal of Botany* has had nothing to say for everal months about "Neo-American" nomenclature.

In the Third Supplement to the Synopsis of the Queensland Flora published in 1890, Mr. F. M. Bailey, Government Botanist, described for the first time an edible species of Citrus new to science, from Harvey's Creek, Russell River, giving it the name *Citrus inodora*. Experiments have been made on the cultivation of this plant by the Queensland Acclimatization Society, and the tree is favorably reported on as a substitute for the West India lime, which its fruit is said to equal in flavor, or for affording a stock on which to graft or bud other Citrus species.

In the Proceedings of the California Academy of Sciences (2d ser. v. 611-733, Oct. 3, 1895) Mr. M. E. Jones under the title of "Contributions to Western Botany, No. VII," publishes an account of his collection of 1894 in the Great Basin The number of new species and varieties discovered by the collector and here described is 104. Astragalus comes in for much attention, one third of the paper being devoted to this genus. The work fails to recommend itself to advantage in one particular in that the author's comments on the "nomenclature question" do not betray an entire calmness of spirit and are mixed up with his discussions of specific limitations throughout the pages. There are also frequent references to serials without citation of volume or page which will prove an inconvenience to monographers and others. We are glad to observe that a large amount of material was collected as the basis of an extended report on geographical distribution and plant adaptation which it is intended to work up in connection with similar material gathered in the Great Basin since 1879. This report we trust that Mr. Jones will soon give us since no one else has had such rare opportunity for field work in the Utah region.

A new serial, *Notizblatt des Konig. botanisches Gartens und Museums zu Berlin*, is being issued under the direction of the staff of the Royal Garden and Museum at Berlin. It is to be devoted to the botanical interests of the German colonies, to the presentation of results which it is desirable to place promptly before those interested, and to the publication of new species.

MESSRS. John M. Coulter and J. N. Rose, who have worked together to large advantage on the Umbelliferæ of the United States, have been making incursions into fields beyond our borders. In "Contributions from the United States National Herbarium," Vol. III. No. 5, they present a report on Mexican Umbelliferae, mostly from the State of Oaxaca, recently collected by C. G. Pringle and E. W. Nelson. The material afforded by the collection "enabled [them] to establish 4 new genera and 27 new species." The new genera are Coaxana, Deanea, Neogoezia and Neonelsonia. The derivation of the first of these names is not given. While this is not a matter of moment the origin of a name is always of interest. The new species belong mostly to Museniopsis, Eryngium, Arracacia and Angelica. The generic characters of Museniopsis are laid down anew and the distinctions drawn between this genus and Eulophus, Arracacia and Velaea. In the same number the rare *Angelica verticillata*, Hook., is figured which Mr. Rose refers to Ligusticum. Two new western species are figured and described: *Ligusticum Eastwoodae* from Colorado and *Velaea glauca* (hitherto considered as a glabrous form of *V. Kelloggii*) from Oregon. This report certainly contains no scant harvest and is one of the most important of recent contributions to the knowledge of American Umbelliferae. Nevertheless, we wish that Messrs. Coulter and Rose might devote their combined energies primarily to the elucidation and illustration of the species north of the Mexican boundary, for there are wide fields ungarnered and few workers fitted for the task.

IN THE *Bulletin of the Torrey Club* for January, Dr. John K. Small offers two new genera of Saxifragaceae, viz., Jepsonia, founded on *Saxifraga Parryi* Torr., and including Saxifraga malvæfolia Greene, and Saxifragopsis, the type being *Saxifraga fragarioides* Greene. In the same number Prof. E. L. Greene describes as new *Saxifraga fallax* from Lassen's Peak and renames *S. umbellata* Greene (not of Hook. f. & Thoms.), as *S. aprica*.

ON MR. PARISH'S PLANTS OF SOUTHERN CALIFORNIA OF 1895.

By EDWARD L. GREENE.

In preparing for distribution a set of herbarium specimens of the plants of his vicinity, Mr. Samuel B. Parish of San Bernardino, California, has done a good work for botany; and we hope his labor may not have been in vain from the point of view that looks to remuneration. His specimens made during the season of 1895 are certainly for the most part very beautiful; not inferior to those distributed by any of our collectors.

As this set contains a number of species for the publication of which I am responsible, and these not rarely under wrong names, it becomes scarcely less than my duty to offer the following corrections and annotations.

The numbers are those of the labels.

3781. "*Delphinium hesperium*, Gray." This is exactly D. SCAPOSUM, Greene, a species very common from almost the Texan border to the Mohave Desert, ranging northward into Nevada, Mr. Shockley having distributed it as *D. azureum* and *D. Menziesii*. No species of the genus is farther removed from *D. hesperium* than this.

3691. "*Ranunculus Californicus*, var. *latilobus*, Gray." The type of what Dr. Gray so designated is very unlike this. It is a tall upright plant with few and very broad leaf-lobes, almost like those of *R. recurvatus*, and it belongs to the seaboard. Mr. Parish's specimen is a very beautiful representation of R. LUDOVICIANUS, Greene, much better than what I had before, and the species is perfectly valid.

3786. This, though given out for a new *Malvastrum*, is my SIDALCEA HICKMANI, though smaller than the Monterey Co. type, and with the inflorescence more spicate-congested. It is, indeed, an aberrant member of the genus *Sidalcea*, as to habit, but its andrœcium excludes it from *Malvastrum*, and will compel its admission into either *Sidalcea* or *Hesperalcea*, unless one take it for the type of a new genus.

3745. "*Trifolium Rusbyi*, Greene." One may determine, by a study of the original description of *T. Rusbyi*, that Mr. Parish's Bluff Lake specimens do not answer to it. These call for the characterization of a new variety, which may be designated

T. RUSBYI, var. **atrorubens.** Plant with the slender-fusiform tap-root and clustered decumbent stems of the type, but leaflets smaller and narrower: heads small, broader than high; flowers sessile, never reflexed: calyx-teeth densely white-villous: corollas of a dark red-purple, only the keel with some white or pink.

As a species *T. Rusbyi* rests, therefore, on its peculiar root character and mode of growth. The plants grow singly, with tufted decumbent stems from a tap-root. *T. longipes*, its nearest relative, forms a sod, its solitary stems arising from matted horizontal rootstocks; and better specific characters are seldom found in this and allied genera.

3630. "*Ribes leptanthum*, Gray." It can hardly be referred to that species, even as a variety. Typical *R. leptanthum* belongs exclusively to the southern Rocky Mountains of S. Colorado, New Mexico and E. Arizona. It has long slender salverform white flowers, and is confluent not with this Californian shrub, but with *R. microphyllum*, HBK., of central Mexico. But this San Bernardino shrub may possibly be referred, as an outlying variety, to my R. VELUTINUM so common along the western verge of the Great Basin, although the type is most unlike this in habit.

3809. SOLIDAGO CONFINIS, Gray. The specimen in my set is large and stout, some two feet of the leafy stem including the panicle, having been broken off; and in the attempt to supply us with a root, and its tuft of radical leaves, our friend has given us a rank specimen of root and leaves of

Œnothera biennis or *grandiflora*, in the first season of its growth.

3714. "*Eriophyllum obovatum*, Greene." Evidently supposed by Mr. Parish to be fairly typical, while it is so far from it, that I should scarcely admit it as of this species. Indeed, I should have referred it at first glance to *E. cæspitosum*. It has not at all the mode of branching, or the broad thick leaves, or the dense white tomentum of *E. obovatum*.

3716. "*Eriophyllum obovatum*, Greene, *forma ?*" And this, which the collector ventures to doubt about, is of the habit of true *E. obovatum*; is really much nearer that type than is the preceding. Though it is more leafy, with narrower and thinner leaves, and also lacks the remarkable dense white tomentum of the type, I should refer it to the species; but it is only a poor representative of it.

3604. SENECIO IONOPHYLLUS, Greene. Good representation of a species which appears as if quite limited in its range.

3726. "*Dodecatheon Jeffreyi*, Moore." Not so, but only very large and fine specimens of the perfectly distinct D. ALPINUM, Greene, Erythea, iii. 39, where the marked differences in the underground parts of the two species, as well as the relatively small and very narrow leaves of the latter are for the first time brought to notice. The species is of the Californian Sierra exclusively, it seems, and these San Bernardino Mountain specimens are of the most southerly habitat as yet recorded; nor will the subalpine conditions demanded by the species be found to recur much further southward.

3757. Indicated as a new variety of "*Mirabilis Californica*," but a good species which may be called:

Mirabilis aspera. Stout, low, scabrous-hispidulous and viscid throughout; the somewhat fleshy leaves cordate-ovate, obtusish, with prominent white midvein and transverse veins; campanulate involucre 5-toothed, the teeth triangular: flowers apparently solitary in the involucres, red-purple: fruit globose, dark olive-green marked by 10 whitish longitudinal striæ, smooth, but under a lens faintly rugulose transversely between the striæ.

The plant is herbaceous throughout, while *M. Californica* is suffrutescent, as well as nearly glabrous, and with ovate smooth and glabrous fruits.

MALVASTRUM SPLENDIDUM, KELLOGG.

By Dr. A. Davidson.

In the Botany of California Brewer and Watson have accorded Kellogg's *Malvastrum splendidum* specific rank, but Gray in his revision considered it as synonymous with *M. fasciculatum*, Greene, and Prof. Greene in "Flora Franciscana" has followed suit.

M. fasciculatum, Greene, is, in the region of Los Angeles the most abundant species of the genus and is one of the commoner foothill shrubs of the San Gabriel range, at least as far east as Palm Springs on the Colorado Desert. This shrub is quite variable in its infloreescence, but always retains a shrubby base and wand-like branches. The infloreescence is sometimes spike-like, the flowers being nearly sessile, at other times it is a widely expanded raceme, but the species is always recognisable as *M. fasciculatum* by its general habit. There is however a form frequently met with on the Colorado Desert with broadly rounded leaves and with a hoary, racemose infloreescence that seems deserving of at least varietal distinction.

M. splendidum is an arborescent shrub or small tree six to fifteen feet in height with slender branches, found growing in the sand-washes and sandy plains of San Fernando Valley, where it is quite a conspicuous feature of the plains. The leaves are two to three inches in breadth and a little less in length, thick in texture and coarsely toothed, broadly and angularly 5-lobed with cordate base; calyx broadly triangular, broader than long, acute; bractlets short, comparatively shorter than those of *M. fasciculatum;* corolla rose color, ¾ in. long; inflorescence a dense racemose panicle twelve to twenty inches long; carpels tomentose above with a stellate pubescence: leaves, twigs and young growth in general covered with a dense white felty covering of stellate hairs. The shrub flowers in June and July. Its tree-like aspect, its broad thick leaves with dense tomentum, the broad calyx and short bractlets, and the late period of flowering all combine to make a valid species.

M. Fremonti, Torr., of which an admirable description is given in "Flora Franciscana," is not infrequent on the San Gabriel Range above 4000 feet, and is the only species that could possibly be confounded with *M. splendidum*, but though sometimes over eight feet high, its habit is totally different, the whole plant being but an aggregation of long virgate branches. The leaves are thicker and the felt of stellate hairs denser; the bractlets most easily distinguish the two being long and setaceous in *M Fremonti*.

SHORT ARTICLES.

OSCILLATORIA TRAPEZOIDEA, Tilden:—In the last number of the Bulletin of the Torrey Botanical Club (page 58) Miss Josephine E. Tilden of the University of Minnesota describes a new Oscillatoria from California which she has named *O. trapezoidea*. The species is said to resemble *O. chalybea* Mertens, "but is larger, shows no spiral arrangement and is clearly distinguished by the shape of the terminating cells of the filament."

The material was collected near Pasadena by Professor A. J. McClatchie, who also sent some of the same material to the writer. Miss Tilden has also very kindly communicated some of the type specimens.

Miss Tilden says, in her article, that *O. trapezoidea* is larger than *O. chalybea*, and gives the diameter of *O. trapezoidea* as ranging from 12μ to 15μ. Gomont (Monogr. des Oscill., p. 253) gives the diameter of *O. chalybea* as from 8μ to 13μ. The material in the writer's possession, shows filaments almost uniformly 12μ in diameter. Certainly an increase in diameter of 2μ might readily be allowed in a species ranging from 8μ to 13μ.

O. trapezoidea is said, by Miss Tilden, to show no spiral arrangement. Gomont says of *O. chalybea*;—"recta, vel interdum in spiram laxam contorta."

Finally *O. trapezoidea* "is clearly distinguished by the shape of the terminating cells of the filament." The end cells in the filaments of the writer's material agree well with Miss Tilden's figure and both agree extremely well with the end cell figured by Gomont for *O. chalybea* (loc. cit., Pl. 7, fig. 19). Furthermore the shape of the terminal cell has been proven by Gomont to be a very important character in distinguishing the species of this genus.

But Miss Tilden evidently refers, not to the terminal cell itself, but to "the mature cells near the extremity of the filament." These cells are wider at one end than at the other giving them a trapezoidal shape as seen in optical-section. This character however is neither constant nor particularly distinct in the writer's specimens. In some filaments a number of such cells may be seen but this shape generally disappears upon the application of weak swelling reagents such as very dilute acetic acid.

The same appearance is seen in most specimens of *Oscillatoria* which have either been dried or preserved in fluid (aqueous or alcoholic) and the writer has been in the habit of considering this appearance due to the greater shrinking of the newer cell walls, (intercalated between each two older ones) because it disappears when the shrinking is counteracted by the ordinary reagents used for that purpose.

In all other respects also, the *O. trapezoidea* seems to agree altogether too closely with *O. chalybea* (particularly with the var. *genuina* Gomont) to be separated from it.

W. A. SETCHELL.

EPHEDRA VIRIDIS, Coville:—This plant has been sent to me from San Luis Obispo County by Mr. L. Jared. It is very abundant on the sides of San Emidio Cañon in the vicinity of the Antimony Mine. The extension of the range of this species is noteworthy. ALICE EASTWOOD.

TRILLIUM SESSILE:—Mrs. Chandler has brought to notice three abnormal specimens of white-flowered *Trillium sessile* var. *Californicum*, found in the San Bruno Hills of San Mateo County. Number one has four leaves and all parts of the flower in fours even to the ovary; stamens eight. Number two has six leaves, six outer divisions of the perianth and five inner, ten stamens and six cells to the ovary. Number three is normal in regard to the symmetry; but one of the outer divisions of the perianth is a true leaf. This species is exceedingly variable in the color, shape and size of its flowers; but such abnormal forms are rare. ALICE EASTWOOD.

MISCELLANEOUS NOTES AND NEWS.

CHAMISSO BOTANICAL CLUB.—The title of Mr. Howe's paper read at the regular meeting held Feb. 20th, was, "A comparison of the Hepatic flora of California with that of the Eastern United States and of Europe." While the Hepatic flora of California is more nearly related to that of Central and Northern Europe than to that of Gray's *Manual* region, it is yet more closely related to that of the Mediterranean region. Mr. Howe illustrated his paper by tables of the comparative distribution of genera and species, but stated that the figures given were as yet tentative. This is in correction of the report on page 60 of our last issue.

THE FOURTH fascicle of the *Phycotheca Boreali-Americana* or "A collection of dried specimens of the Algæ of North America" has just come to us. Among the 200 species of North American Algæ already distributed by Messrs Collins, Holden and Setchell in this work, 23 are from the coast of California, contributed by Mrs. J. M. Weeks of Pacific Grove and Mrs. E. Snyder of San Diego. The Californian numbers and species are as follows:—46 *Polysiphonia Woodii* Harv., 48 *Microcladia borealis* Rupr., 50 *Erythrophyllum delesserioides* J. Ag., 76 *Chætomorpha ærea* (Dillw.) Kuetz., 85 *Glossophora Kunthii* (Ag.) J. Ag., 86 *Zonaria Tournefortii* (Lamour.) Farl., And., & Eaton., 90 *Gelidium Coulteri* Harv., 91 *Iridæa laminarioides* Bory, 96 *Callithamnion dasyoides* J. Ag., 100 *Gloiosiphonia verticillaris* Farlow, 131 *Postelsia palmæformis* Rupr., 135 *Gelidium cartilagineum* (L.) Grev., 136 *Endocladia muricata* (P. & R.) J. Ag., 137 *Gigartina horrida* Farlow, 139 *Chrysymenia pseudodichotoma* Farlow, 144 *Polysiphonia bipinnata* P. & R., 146 *Dasya subsecunda* Suhr, 147 *Antithamnion floccosum* var. *Pacificum* Harv., 148b. *Centroceras clavulatum* (Ag.) Mont., 172 *Sphacelaria tribuloides* Menegh., 176 *Pelvetia fastigiata* (J. Ag.) De Toni, 179 *Sargassum Agardhianum* Farlow, 199a & b. *Prionitis lanceolata* Harv.

VOLUME IX of Sargent's "Silva of North America" has appeared. This part contains the remaining Cupuliferæ, and the Salicineæ.

DR. A. HERAND has published in Paris a "Nouveau Dictionaire des Plantes Medicinales."

PROF. A. N. PRENTISS, who recently resigned the head Professorship of Botany in Cornell University, has been made Emeritus Professor. His successor has not yet been chosen.

NOTES ON SPHÆROCARPUS.

By Douglas Houghton Campbell.

The genus Sphærocarpus comprises, according to Schiffner[1] five closely allied species of which one, *S. terrestris* var. *Californicus* is one of the commonest and most characteristic Californian liverworts. In the vicinity of Stanford University it occurs abundantly upon the ground, and grows both upon clayey and sandy soil in shady places or less commonly fully exposed to the sun. Owing to the inflated involucre about each of the numerous archegonia which usually almost entirely cover the dorsal surface of the female plant, the latter presents a most characteristic appearance and is not to be mistaken for any other form. The male plants are usually much smaller and less conspicuous.

During some recent studies on liverworts, the writer has had his attention called to some peculiarities in the growth of this plant which it was thought were of sufficient interest to be noted. These notes are given here, together with others upon the early phases of germination which do not seem to have been critically studied, although Leitgeb[2] gives a brief account of some of the earlier stages of the germinating plant in the European form of our species. This same author includes Sphærocarpus among the forms treated in his magnificent work upon the liverworts, where the older literature is also cited. The writer[3] has also given an account of our Californian plant in a recent treatise.

Sphærocarpus is of peculiar interest to the morphologist, as it is on the whole, probably the simplest of all known liverworts, and appears to stand very near the point where the Marchantiaceae and Jungermanniaceæ diverge, showing unmistakable affinities with both of these groups; hence any further information concerning its development is interesting

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[1] Engler & Prantl. Die natuerlichen Pflanzenfamilien 91, 92, p. 51.

[2] Leitgeb, Untersuchungen ueber die Lebermoose, IV, p. 73.

[3] Campbell, Structure and Development of the Mosses and Ferns, p. 74.

as bearing upon the problem of the relative position of these two great groups of liverworts.

The ripe spores of our species are nearly globular, about 65–70μ in diameter. The nearly black exospore is marked with very distinct reticulately anastomosing ridges. In numerous specimens, collected from various localities near Stanford University, the spores were almost always quite separate at maturity, although in all the published descriptions of Sphærocarpus that I have examined, the spores are described as being permanently united in tetrads. Professor L. M. Underwood writes me, however, that he has also observed the separation of the ripe spores. As is well known, no perfect elaters are present, but the oval sterile cells which are mingled with the spores, no doubt are the homologues of the elaters of the more specialized liverworts.

The germination of the spores corresponds closely to that of Riccia,[4] especially in the formation of a very long germ-tube which is almost always present. The ripe spores contain no chlorophyll and owing to the opacity of the exospore it is difficult to see clearly the character of the contents beyond the fact that they are dense and opaque. The spores probably require a period of rest before germinating, but this was not tested. Those collected as soon as they were ripe, about the middle of May, germinated freely in the autumn and winter, but the later sown spores did not seem to germinate quite so promptly, although no exact record was kept. The first signs of growth are usually evident within a week or less after the spores are sown. The exospore is ruptured and through the cleft the endospore protrudes as a slender papilla which rapidly elongates until it forms a slender filament, or germ-tube, of considerable length. At first its contents are opaque, owing to the granular matter and small oil drops present; but as it lengthens these are carried out to the end leaving the basal portion almost destitute of granular contents and quite colorless. Only a few chloroplasts are evident at first, but these soon enlarge and divide rapidly so that before the first division takes place the end of the germ-tube appears bright green; in the basal part of the germ-tube chlorophyll is almost completely absent.

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[4] Campbell, Mosses and Ferns, p. 87.

The first division wall arises near the end of the germ-tube and separates most of the granular protoplasm from the colorless part of the tube. This first wall is followed in most cases (Fig. 2), by one or two others parallel with it, before any longitudinal divisions occur. The next divisions are variable and it is difficult to say what is the commonest arrangement of the secondary walls. Sometimes by two intersecting longitudinal walls in each primary cell, except the long basal cell which undergoes no further divisions, the young plant assumes the form of a cylindrical body composed of several tiers of four cells each; but more commonly the divisions are less regular, one of the longitudinal walls being suppressed in some or all of the primary cells, or the basal cell may remain entirely undivided.

If the first longitudinal wall in the terminal cell is oblique, there is formed at once a two-sided apical cell (Fig. 3, 4) of the type found in Aneura and Metzgeria, and often in the early stages of many other liverworts and the prothallia of most ferns. Where four similar terminal cells are formed by the intersection of two median longitudinal walls, one of these usually becomes the single apical cell of the thallus, and in most cases, by secondary divisions assumes for a time the two-sided form. As soon as the apical cell is established, the growth of the thallus is brought about by the formation of regular segments cut off alternately right and left from the apical cell. At this stage the thallus closely resembles that of Aneura or a young fern-prothallium such as that of Osmunda or Marattia, where from the first there is a thickened central region. In a few cases observed, (Fig. 6) where the first longitudinal walls were strictly median, the formation of a single apical cell was not so evident, the divisions on both sides of the median wall being much alike. The apical cell seen in longitudinal section at this stage, (Fig. 7) closely resembles that of the typical fern-prothallium.

Sooner or later the two-sided apical cell is replaced by the type found in the fully developed thallus. This is probably brought about as in other similar cases by the formation of a transverse wall in the apical cell, dividing it into an inner triangular (seen in longitudinal section) and an outer four-sided cell. The latter is the definite apical cell. From this at first three sets of segments are formed, two lateral and one basal, but later four, as finally two sets of basal segments are formed by walls inclined alternately toward the dorsal and ventral surfaces of the thallus. This is the type of apical cell found in the full grown thallus and is the same as that of the Marchantiaceæ. Owing to the very similar appearance both in form and size of the apical cell and its lateral segments, it is often difficult to say positively that there is but a single initial cell.

The first rhizoid does not usually appear until the young thallus is already multicellular. It arises as an outgrowth from the base of the germ-tube (Fig. 4, r.) but is not separated from it by a cell-wall. No new ones are formed for some time, and these arise from the basal cells of the thallus.

The further history of the development of the normal thallus has been sufficiently described before and will not be further considered here.[5]

The abnormal plants to which reference has been already made appeared in a culture of other liverworts grown under glass, so that the amount of moisture was greater than is the case in their natural habitat. However it was afterward found that plants growing spontaneously in unusually moist or shaded places showed a similar tendency to an excessive development of the vegetative parts of the thallus. So different in appearance were these abnormal plants from the usual form, that it was some time before their real nature was understood. The most striking peculiarity was the great development of the vegetative parts with a corresponding reduction in the number of sexual organs. Leitgeb[6] mentions similar forms occurring in his cultures as adventitious buds but these seem to have been small and sickly, while my plants grew vigorously and exceeded in size the normal ones. This was especially the case with the male plants which were several times larger than the normal form. The dichotomous branching is very conspicuous in strong contrast to the very obscure branching of the normal plants where on account of the excessively short branches the thallus appears unbranched and almost orbicular in outline. The dichotomy is entirely similar to that in other similarly branched liverworts, and as in these, there is a conspicuous "median-lobe" (Fig. 9. l.) between the branches. A remarkable characteristic of these plants was the presence of regular marginal lamellæ, which in origin and position are directly comparable to the leaves of Blasia or Fossombronia, and seem to be strictly homologous organs. The margin of the normal plant is almost completely undivided and shows little or no traces of similar structures. It may be remarked, however, that the recently described Geothallus, which seems to be the nearest relative of Sphærocarpus, has well-marked leaf-like marginal lamellæ.

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[5] Leitgeb, l. c. Campbell, l. c.

Another peculiarity of these plants is the late appearance of the sexual organs. Ordinarily these are evident very early. Leitgeb[7] mentions cases where he observed them upon plants only .1 mm. in diameter. In our plants they were often not formed until after the first dichotomy of the thallus which occurred when the plants had reached a length of several millimetres. They were in most cases produced sparingly, although some specimens finally developed them in normal numbers.

Where the ripe spores were seen they were united in tetrads.

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[6] l. c., p. 65. Pl. IX., fig. 20.

[7] l. c., p. 73.

CONCLUSION.

The formation under certain circumstances of leaves of the type of those in typical Anacrogynous Jungermanniaceæ is one more point in favor of placing Sphærocarpus with these rather than with the Ricciaceæ, with which it agrees however, very closely in its germination, apical growth, and the structure of the sexual organs.

EXPLANATION OF FIGURES.

Fig. 1. Two germinating spores of *Sphærocarpus terrestris* var. *Californicus*, × about 70.

Fig. 2. Apex of the young plant showing the first divisions, × about 400.

Fig. 3. A somewhat older stage than that shown in Fig. 2, seen in horizontal (optical) section, the apical cell (x), × about 400.

Fig. 4. Young thallus seen from the side showing the long germ-tube and first rhizoid (r.), × about 70.

Fig. 5. Horizontal (optical) section of young thallus with two-sided apical cell (x), × about 200.

Fig. 6. Similar section of young thallus with apparently more than one initial cell, × about 200.

Fig. 7. Longitudinal section of young thallus, × about 200.

Fig. 8. Surface view of young thallus with two-sided apical cell, × about 400.

Fig. 9. Small female plant, showing abnormal development of the thallus, × 13, (l) lobes between the branches.

Fig. 10. A similar, but larger male plant, × 3.

NEW SPECIES OF KANSAS FUNGI.—I.

By J. B. Ellis and Elam Bartholomew.

Polyporus cryptopus. On the ground in sandy pastures attached to dead grass roots. Rooks Co., Kan., July 24, 1895 (No. 1800).

Pileus orbicular, 3–4 cm. diam., grayish white, margin very thin, involute-repand or evenly incurved, smooth, or slightly wrinkled but not scaly. Stipe 1½–2 cm. long, almost entirely subterranean, slightly swelled at the base, thickened above to about 1 cm. or less at its attachment to the decurrent hymenium. Pores about ¾ mm. diam. by 1¾ mm. in depth, mostly subangular, margin uneven, covered with a subgranular tomentum. Spores white, nucleate, obtuse or acuminate-elliptical, 5–7 x 3–4μ.

A fine, well marked species very abundant in one locality, peculiar in its habitat, looking like small whitish discs lying flat on the ground!

Puccinia clavispora. On leaves of *Andropogon nutans*. Phillips Co., Kan., Aug. 30, 1895 (No. 1911).

II and III. Amphigenous. Sori linear, at first covered by the yellowish epidermis, then naked, 1 mm. to 1 cm. long. Uredospores obovate, 20–40x18–25μ, subechinulate, roughened, with stout club-shaped paraphyses and stout but deciduous pedicels. Teleutospores clavate, 40–60x18–22μ, constricted above the middle, the upper cell subglobose or short-elliptical and darker; the lower paler and gradually attenuated below into the very stout pedicel. Epispore smooth, thickened and rounded at the apex.

From *P. omnivora*, E. & E., this differs in its longer and broader, more deeply constricted teleutospores and very short almost obsolete pedicels.

Puccinia tecta. On leaves of *Carex sparganioides*. Rooks Co., Kan., Oct. 7, 1895 (No. 1972).

II and III. Hypophyllous, thickly scattered along the entire leaf. Uredosori soon rupturing the epidermis and profusely discharging the spores over the leaf. Uredospores broadly elliptical or obovate, 20–25x15–18μ, distinctly echinulate at first, nearly hyaline, then smooth and light yellowish, filled with fine granular matter throughout without nucleus. Epispore very thin,—1μ thick. Paraphyses common in some of the sori. Teleutosori abundant, very small, about ¼ mm. diam., nearly round, persistently tectate, running by confluence into long continuous patches entirely covering large areas of the host. Teleutospores light to dark yellow, clavate to oblong, 40–60x15–18μ, lower cell usually wedge-shaped and nearly hyaline; upper cell often terminating in a curved acuminate beak or rounded, or flat on top; nearly all containing either nuclei or fine granular matter. Pedicels stout, hyaline, 10–25μ long. Approaches *P. angustata*, Pk., but differs from that in its paraphysate uredosori and in its smaller and persistently tectate teleutosori.

Phoma biformis. On dead *Amorpha fruticosa*. Rooks Co., Kan., March 16, 1896 (No. 2057).

Perithecia scattered on the weather-beaten, decorticated wood, innate-erumpent, hysterii-form, ¾–1 mm. long, ovate-conical, ½–1 mm. diam. Sporules oblong-elliptical, 2-nucleate, hyaline, subobtuse, 6–7x2μ. Basidia simple, obclavate 12x2μ.

P. Amorphæ, Sacc., has the perithecia globose-lenticular and much smaller with ovate sporules 6–7x4μ.

Cytispora celastrina. On dead stems of *Celastrus scandens*. Rooks Co., Kan., April 5, 1895 (No. 1716).

Stromata scattered or subseriate, 1–1½ mm. diam., sunk in the inner bark, raising the epidermis into pustules which are soon ruptured, exposing the stout, short-cylindrical, broadly perforated ostiolum, black inside, multilocular, (8—10-celled). Sporules oblong, straight or slightly curved, 6–8x 1½μ.

Differs from *C. Celastri*, Clem., in its much shorter, scarcely curved sporules.

Cytispora Gleditschiæ. On dead limbs of *Gleditschia triacanthos*. Rooks Co., Kan., Dec. 16, 1895 (No. 2011).

Perithecia circinate on the surface of the inner bark. Ostiola convergent and erumpent together in a small, black disc pierced by a single pore. Sporules allantoid, 5–6x1¼μ, slightly curved.

Sphaeropsis Robiniæ. On dead branches of *Robinia pseudacacia*. Stockton, Kan., Nov. 29, 1895 (No. 1990).

Perithecia scattered, sunk in the surface of the inner bark, 190–230μ diam., raising the epidermis into flattish pustules which are pierced in the centre by the minute papilliform ostiolum, but not ruptured. Sporules oblong-elliptical, brown, 15–21x8–9μ.

Sphæropsis Triacanthi. On dead limbs of *Gleditschia triacanthos*. Rooks Co., Kan., Dec. 9, 1895 (No. 1993).

Perithecia scattered, subcuticular, becoming superficial, hemispherical or conic-hemispherical, 400–600μ diam. and when uncovered, black and shining. Sporules elliptical, brown, 15–22x9–11μ.

This differs from *Sphaeropsis Gleditschiaecola*, Cke., Grev. VII, p. 33, in its scattered perithecia and smaller sporules. Kansas specimens of this last named species, on limbs of *Gleditschia*, have the minute perithecia 3–10 in a hemispherical, erumpent stroma, 1–1½ mm. diam. with oblong sporules 12–16x6–8μ.

Haplosporella longipes. On dead branches of *Morus alba*. Rooks Co., Kan., Dec. 9, 1895 (No. 1992).

Stromata depressed-globose, ¾–1 mm. diam., semi-erumpent, black, often collapsing above. Perithecia small, 6–10 in a stroma. Sporules oblong or oblong-elliptical, brown, 12–20x5–6μ, often slightly curved. Basidia slender, 75–90μ long, resembling paraphyses.

H. moricola, Berl., has sporules 20–23x10μ on stout and shorter basidia.

Haplosporella Negundinis. On fallen limbs of *Negundo aceroides*. Rooks Co., Kan., Feb. 26, 1896 (No. 2051).

Perithecia caespitose-erumpent, depressed-globose, ⅓ mm. diam. with a papilliform ostiolum. Sporules oblong, obtuse, 20–25x10–12μ brown. This is a well marked but rare species.

Diplodia inquinans. On fallen limbs of *Negundo aceroides.* Phillips Co., Kan., March 23, 1896 (No. 2072).

Perithecia scattered or 2–3 together, not confluent, buried in the bark which is slightly raised and perforated by the papilliform ostiolum, ⅛–⅓ mm. diam. Sporules oblong-elliptical, brown, uniseptate, scarcely constricted, 12–15x3–4μ, abundantly discharged and blackening the surface of the bark as in *Melanconium.*

Differs in this respect and in its smaller sporules from the other species on *Celtis.*

Cercosporella nivea. On living leaves of *Solidago radula.* Rooks Co., Kan., Sept. 23, 1895 (1951).

Scattered over both sides of the leaves without any spots, forming small, nearly snow-white patches. Fertile hyphæ caespitose, continuous, hyaline, oblong-cylindrical, subentire, sometimes swollen at the tips, 15–25x4μ. Conidia long, slender, multi-nucleate, hyaline, 100–160x3–4μ.

Outwardly resembles *C. cana*, Sacc., but the hyphae are very different and the conidia much longer and narrower.

Coniosporium Maydis. On old corn stalks. Rooks Co., Kan., July 24, 1895 (No. 1789).

Conidia globose or subglobose, brown, 3½–5½μ diam. seated on an orbicular, flattish-tubercular stroma ½–1 mm. diam. and with the black stratum of conidia resembling a black *Patellaria.*

Differs from *C. inquinans*, D. & M. (as represented in F. Gallici 4697) in its darker color, rather larger conidia and the presence of the gray tubercular stroma. The tufts in our specimen show indications of becoming confluent in which case it would closely resemble *C. inquinans.*

Dendryphium curtipes. On the underside of an old hog trough. Rooks Co., Kan., Dec. 20, 1894 (No. 1612).

Hyphae caespitose, short, 30–40x8μ, obscurely septate, simple, each bearing a chain of 3–6 truncate-fusoid conidia 40–50x8–9μ, 6–8 septate, dark brown, almost opaque. The hyphae which arise in spreading tufts directly from the matrix, are hardly distinguishable from the conidia.

Cladosporium subsessile. On living leaves of *Populus monilifera.* Sept. 18, 1894 (No. 1576).

This species was issued in *North American Fungi*, No. 3288, and described in ERYTHEA, IV, 27, as *C. brevipes*, Ell. & Barth., but as there is already a *C. brevipes*, Peck, necessity requires the present rechristening of our species.

DISTRIBUTION OF RHAMNUS IN AMERICA.—I.

By EDWARD L. GREENE.

The type of the genus *Rhamnus* is a shrub or small tree of middle and southern Europe of considerable economic value, treated of under that name by the Greek botanists of antiquity, first designated *Rhamnus catharticus* by Bauhin as long ago as 1623, and now everywhere received under that binary name.

An aperient syrup prepared from the berries of this bush was in use from time immemorial down to at least the beginning of the present century by all medical practitioners; though in recent years it has been to a great extent replaced by less drastic purgatives. It was said that even the flesh of birds that had fed upon the berries produced, to some degree the same effects. The juice of the unripe berries is of a deep yellow, and is used in staining papers. They are sold in England under the name of *French Berries.* The juice of the ripe berries, treated with alum is the beautiful *sap green* of the painters. The bark affords a well known and much used yellow dye; and the unripe berries dye wool green. Charcoal prepared from the wood of this shrub is in demand for the manufacture of the finest qualities of gunpowder. The insignificant green blossoms of the species are peculiarly grateful to bees, and goats, sheep and horses devour the foliage, though it is refused by cows. Its rigid spinescent branches adapt it to use in making hedges, for which purpose it was long since introduced into eastern North America, where it is now sparingly naturalized.

So nearly related to this historic type as to be generally received in the same genus are something like a hundred other species now recognized by botanists. They are distributed all around the northern hemisphere, chiefly within the temperate zone. The species of the southern hemisphere are extremely few.

In comparison with Europe, to which twenty-three species are credited, North America north of Mexico is not well stocked with *Rhamnus*; for we can hardly claim more than fifteen, four or five of which are of the Atlantic slope, all the rest belonging to the Pacific slope proper; that is, to the narrow strip of territory intervening between the crest of the Cascades and Sierra Nevada and the shores of the Pacific; neither the Great Basin nor the Rocky Mountain region exhibiting any species, except at the extreme north, where one of the eastern, *R. alnifolia*, traverses the continent, and becomes the only one common to both the eastern and western floras of the country.

If, then, eastern North America has of this genus three or four endemic species, the much smaller area of the Pacific slope proper has at least three times as many. Nor could it be expected to be otherwise by any who know and appreciate the vastly greater diversity of soils, altitudes and degrees of humidity existing on that farther side of North America. In California alone the species are distributed upon all altitudes, from the sea-level up to almost seven thousand feet; some of them occurring only where the annual rainfall amounts to no more than four or five inches, others where it amounts to one hundred inches or more. They are distributed all along from where the mercury seldom in the coldest winter indicates the freezing point of water, and snow never falls, up to where zero of Fahrenheit is reached, and snow falls to the depth of ten feet, or even more. Nothing approaching these climatic extremes are to be found within the limits of the East American Rhamnus territory. Indeed, so very great is the diversity of environment on that narrow strip of the far-western field, that one might with reason expect a greater number of species than have been recognized hitherto.

Before taking up the subject of the actual dispersion of the species it may be useful to indicate certain natural and easily recognizable sub-divisions of the genus. The name of these, and their characters are as follows:

1. RHAMNUS proper. Leaves thin, deciduous: fruits black: pyrenes thin-walled, indehiscent: seeds with cartilaginous testa, grooved on the back; cotyledons foliaceous, revolute-margined.

2. FRANGULA. Leaves firmer: fruits black: pyrenes thick, indehiscent: seeds with thin testa, not grooved; cotyledons fleshy, plane.

3. XANTHORHAMNUS. Leaves coriaceous, evergreen: berries cherry-red: pyrenes crustaceous, promptly dehiscent: seeds with crustaceous testa, deeply grooved or excavated on the back; cotyledons fleshy, strongly curved.

Rhamnus proper, though strongly developed in the Old World, is very feebly represented in America. In fact, we have but a single species which can with perfect confidence be so referred, namely,

1. R. LANCEOLATA, Pursh, Fl. i, 166. This, though apparently nowhere plentiful, nor continuously distributed, occurs at intervals between western Pennsylvania and eastern Nebraska; thus however illustrating a general law respecting the distribution of the *Rhamni* of the East, that their greatest range is east and west, whereas, on the opposite side of the continent the species take a meridional line of dispersion, holding to such lines very strictly.

Northwardly *R. lanceolata* does not appear to range beyond the forty-second parallel, while to the southward it hardly passes the thirty-fifth, except as reaching northeastern Texas. It is an inhabitant of dry grounds, preferring rocky hillsides; thus, in point of habitat as in other particulars, very unlike its next of kin. The species is supposed to embrace the *R. Shortii* of Nuttall, and *R. parvifolius* of Torr & Gray; though Nuttall was very positive that his species was distinct from it, and the matter may need further investigation.

2. R. ALNIFOLIA, L'Her. Sert. Angl. 5. This common and widely dispersed shrub of cold northern swamps is most unlike the preceding in its thin and very conspicuously pinnate-veined leaves; the venation of *R. lanceolata* not being in any wise prominent. It is in equally marked contrast with the type of *Rhamnus*, i. e. *R. cathartica*, the venation of the leaves of which is almost wholly longitudinal and parallel, as well as very prominent. These characters taken in conjunction with pyriform berries, the thin soft seed-like texture of the pyrene, and its cuneate-obovate outline, furnish something like a justification for Rafinesque's proposal to constitute this a genus, *Girtannera*. The species is, nevertheless, technically congeneric with *R. lanceolata*, whether naturally so or not. In its eastern distribution it barely overlaps with *R. lanceolata* at the northern limit of that species, and thence extends northward over at least ten degrees of latitude, and, along the British boundary runs westward to the most northwesterly extension of the Rocky Mountains, then passing southward along the eastern declivity of the Cascades and Sierra Nevada to near the headwaters of the Truckee River. It thus becomes the only *Rhamnus* which almost traverses the continent; and, at its western limit it is curious to note that it conforms to the law of distribution there dominant, running southward for some hundreds of miles in an extremely narrow belt.

NOTES ON CYANOPHYCEÆ.—I.

By W. A. Setchell.

In the Bulletin of the Torrey Botanical Club for October, 1895 (pp. 424–431), the writer began a series of notes upon new or little-known species of the group of the Blue-Green Algæ and made a brief reference to the condition of our knowledge of the North American species.

The Blue-Green Algæ are widely distributed throughout the marine and fresh waters of the earth and many besides are not aquatic but grow simply in moist localities. There is, however, a great similarity as regards species, between the different countries and this will probably be increased as our knowledge of the distribution of the members of the group is increased.

The writer hopes that more collectors may pay attention to the gathering of these plants, and that they may be submitted ultimately to the highest authorities, Messrs. Bornet and Gomont of Paris, for verification or correction. The writer desires to thank these great monographers for assistance in determinations, at every step.

Calothrix fusco-violacea Crouan has been known only from the Atlantic and Mediterranean shores of France where it is very rare. In these localities it grows upon stones or shells. It was found by Mr. Charles P. Nott of Brown University growing upon fronds of *Punctaria plantaginea* at Woods Hole, Mass., during the summer of 1895. Upon the Punctaria, it forms orbicular velvety patches, about ½ inch in diameter, which vary from a deep reddish purple to a dark blue green. It resembles *C. confervicola* Ag., but is distinguished from that species by its gregarious habits and its slightly smaller trichomes.

Species of the genus *Dichothrix*, nearly related to *Calothrix*, are not uncommon, in this country, in ponds and streams but seem to give great trouble in regard to exact specific determination. Wolle has credited a number of species to the United States under the names of *Calothrix Orsiniana*. *C. Dillwynii*, *C. gypsophila*, *C. radiosa*, *C. Meneghiniana*, *C. crustaceum*, and probably also *C. lacucola* and *C. Hosfordii*. These references of Wolle's can be accurately determined however, only by one who may have the opportunity of consulting his herbarium specimens. Bornet and Flahault had no fresh water material from North America, but the following fresh water species have been determined for the writer by Dr. Bornet.

Dichothrix Baueriana (Grunow) B. & F. occurred to Dr. Herbert M. Richards upon rocks in a lily pond near Newport, R. I., and to the writer in Round Pond at Lantern Hill in Ledyard, Conn. The filaments form a verdigris-green, plush-like coating about ¼–⅜ of an inch thick, upon rocks and small stones. It was again found by the writer growing upon stones about the edges of Lake Whitney, in Hamden, near New Haven, Conn.

Dichothrix gypsophila (Kuetz) B. & F. formed gelatinous yellowish masses upon rocks and small stones about the edge of Long Pond at Lantern Hill in Ledyard, Conn., in September, 1892. The gelatinous character was due chiefly to a small *Schizothrix* which grew with the *Dichothrix*.

Rivularia haematites (DC.) Ag., as yet known with certainty only from Europe, where, however, it is widespread, grows upon dripping rocks at Bridal Veil Falls in Williams Cañon, near Manitou, Colorado. It forms a reddish crust of considerable extent and thickness and is somewhat zonate within.

Stigonema informe Kuetz, known certainly in this country only from Aiken, South Carolina, was found in small quantity in Long Pond at Lantern Hill, in Ledyard, Conn.

Scytonema ocellatum Lyngbye forms a dark brown felt upon rocks just above the surface of Massapoag Brook at Sharon, Mass. It is a very widespread species but is not credited to North America by Bornet and Flahault.

Scytonema mirabile (Dillw.) Bornet, as a name, replaces the *Scytonema figuratum* of Bornet and Flahault's monograph. It has been found in the Eastern United States by Farlow. It grows in pannose layers upon the "Pillars of Hercules," in South Cheyenne Cañon near Manitou, Colorado.

Nostoc Linckia (Roth) Bornet occurs in Lake Saltonstall, near New Haven, Conn. It forms thickish sheets of a pale green color and very much crumpled. Occasionally some trace of its original globular shape is preserved and it forms large imperfect bladders several inches in diameter.

Schizothrix fasciculata (Naeg.) Gomont was detected by M. Gomont in material sent him by the writer. The specimens were obtained at Twin Lakes, near Salisbury, Conn. It was mixed with *Rivularia Biasolettiana* Menegh.

Hydrocoleum lyngbyaceum Kuetz var. A. Gomont, was very abundant upon the fronds of *Ascophyllum nodosum* in the harbor at Woods Hole, Mass. during the summer of 1894. It was first found by Mr. Charles P. Nott.

Lyngbya ærugineo-coerulea (Kuetz.) A. Gomont, found thus far only in France and Germany, was detected by M. Gomont in specimens sent him from Tom Mt., Salisbury, Conn.

SHORT ARTICLES.

Local Uses of Plants.—A resident of the Redwood region of Sonoma Co., Cal., recently pointed out to me *Achillea Millefolium*, at Fort Ross, stating that the leaves when steeped in hot water and applied to a cut or other new wound, had a remarkable healing effect. *Rhamnus Californica* has been reported more than once as an old Indian remedy of great efficacy in rheumatic affections: it is possible that *R. Californica* and *R. Purshiana* may have been confused in the minds of those volunteering this information.

However, quite recently a physician of Oakland, Calif., brought specimens of *R. Californica* to the Botanical Department of the University of California for identification, saying that he had used it with great success in rheumatic affections. Dr. H. H. Rusby, commenting on this fact, writes me "the anti-rheumatic properties of which your friend speaks, are doubtless indirect; a result of more perfect excretion." Any additional information on the uses of these and other of our native plants, will be welcomed by members of this Department: in all cases specimens for identification should accompany a statement, and the part of the plant which is used, and the way in which it is used, should be indicated. J. BURTT DAVY.

ADDITIONS TO THE "MANUAL OF THE BAY-REGION BOTANY." —*Rhododendron Californicum*, Hook., is reported to me on reliable authority as occurring in profusion near Fort Ross, Sonoma Co. The well-known station for it on Mt. Tamalpais, Marin Co., was doubtlessly accidentally omitted when the *Manual* went to press. *Œnothera Californica*, S. Wats, sandhills, Antioch, Contra Costa Co., Apr. 7, 1895; *Goodyera Menziesii*, Lindl., Turner Canon, Sonoma Co., Mch. 14, 1896; *Calypso borealis*, Salisb., Cazadero, March 20, 1895 (Miss Atterbury); *Malva rotundifolia*, L., Fort Ross, Sonoma Co., March 15, 1896.

J. BURTT DAVY.

MISCELLANEOUS NOTES AND NEWS.

DR. CARL MEZ of Berlin has monographed the order Bromeliaceæ in De Candolle's Monographiæ Phanerogamarum, Vol. IX, just issued. The order takes up the whole volume.

WHILE Central and South America are receiving considerable attention from botanists of the United States this year, with Dr. Rusby on the Orinoco, Capt. John Donnell-Smith in Nicaragua and Mr. Squires in Venezuela, South Africa is receiving attention from the Germans. It is announced that Mr. M. A. Schlechter of Berlin is about to start on a collecting tour in South Africa. He will visit the Coud-Bokeveld, Namaqualand, Transvaal, and the Limpopo and Zambesi rivers.

PROF. D. OLIVER of Kew, has resigned the editorship of Hooker's *Icones Plantarum* the publication of which he has superintended since 1891. This work contains figures with descriptions of new or rare plants, of which specimens are contained in the Herbarium of the Royal Gardens, Kew. It will in future be edited by the Director, Dr. Thiselton-Dyer for the trustees of the late Geo. Bentham.

IT has been stated that the seeds of *Ginko biloba* are "acrid and poisonous when raw, but innocuous when roasted." The fruits, cleansed from the fleshy outer covering, leaving only the whitish "nuts," are sold in the stores of China-Town, San Francisco, and are cooked and eaten by the Chinese. The seeds have been eaten in the raw state, within our knowledge, without any inconvenient results, but they are not agreeable to the palate unless roasted.

AT THE meeting of the Academy of Science of St. Louis, Mo., held Jan. 20, Mr. C. H. Thompson exhibited specimens of *Wolffia lingulata*, which he collected in Kern Co., California, last autumn. Both species belong to the sub-genus Wolffiella, of which flowers and fruits are quite unknown. This species seems to have been known heretofore only from Central Mexico.

MR. ROY W. SQUIRES is about to spend some six months in a botanical exploration in Venezuela on behalf of the University of Minnesota. The area to be visited is the unexplored mountain region southeast of Barancas, considerably south of any previous botanical trips in that republic.

MR. WM. I. SCLATER, formerly Curator of Eton College Museum, England, has been appointed to the curatorship of the South African Museum, Cape Town, in the place of Mr. Roland Trimen, F. R. S., F. L. S., who has resigned.

MISS CLARA E. CUMMINGS, Associate Professor of Botany in Wellesley College, is now traveling in California.

WE HAVE received Part VI of "Hough's American Woods" which illustrates twenty-five trees and shrubs of the Pacific Coast by thin sections of their wood in radial, longitudinal and transverse directions. The preparations are very beautiful and are accompanied by descriptive text. The following species are included: *Æsculus Californica*, *Rhamnus Purshiana*, *Cercocarpus ledifolius*, *Prosopis juliflora*, *Cercidium Torreyanum*, *Garrya elliptica*, *Arbutus Menziesii*, *Arctostaphylos pungens*, *Platanus racemosa*, *Salix laevigata*, *Chilopsis saligna*, *Quercus agrifolia*, *Q. Garryana*, *Q. densiflora*, *Sequoia gigantea*, *S. sempervirens*, *Torreya Californica*, *Pinus contorta*, *P. ponderosa*, *P. Lambertiana*, *Pseudotsuga taxifolia*, *Picea Sitchensis*, *Taxus brevifolia*, *Libocedrus decurrens*.

PART 13 of Prof. Greene's *Pittonia*, issued under date of May 1, has recently been received by us. It contains five articles, viz: Nomenclature of the Fuller's Teasel; Proposed New Genus of Cruciferæ; New or Noteworthy Species, XV; New Genus of Polemoniaceæ; Some Mexican Eupatoriaceæ. [Payot, Upham & Co., San Francisco, 50c.]

THE *Botanical Gazette* with the March number passed into the possession of the University of Chicago. The editorial board remains unchanged.

MR. J. BURTT DAVY is now investigating the vegetation of the alkali areas of the upper San Joaquin Valley in California and will also botanize to some extent in the Mohave Desert region.

MR. M. A. HOWE will spend May and June in Mendocino and Humboldt counties of California engaged in making field-studies and collections of mosses and hepatics.

ON DR. D. PRAIN'S ACCOUNT OF THE GENUS ARGEMONE.

By ALICE EASTWOOD.

In the December number of the *Journal of Botany* Dr. Prain concludes his work on the Genus Argemone which was begun in the May number and continued through June, July, October and November.

In the first part he explains that his paper embodies the results of an examination of the herbaria of London, Paris and Geneva and is to be considered an account of the specimens of Argemone in the herbaria examined, rather than a final review of the genus. This tentative revision he offers, more in the hope that its perusal may induce American botanists, who alone are in the position to undertake the necessary field study, to prepare the much needed authoritative revision that is called for, than in the belief that his conclusions are justifiable. While he finds it impossible to pronounce a final opinion on the systematic rank of any of the different forms which he defines, save one (*A. fruticosa*), it has been found possible, with the assistance of the European material, to assign authoritatively to all but one of them (*A. corymbosa* Greene) their primary bibliographic references.

With his broad knowledge of the Papaveraceae, Dr. Prain discusses the generic characters of Argemone and its relationship to allied genera and shows that the generic distinctions between Argemone and Romneya, between Romneya and Arctomecon are of the slightest.

In Argemone there are eleven species easily distinguishable, these being as follows: *A. mexicana* L., *alba* Lestib., *grandiflora* Sweet, *intermedia* Sweet, *platyceras* Link & Otto, *fruticosa* Thurb., *ochroleuca* Sweet, *glauca* Nutt., *rosea* Hook., *hispida* Gray, *stenopetala* Prain. Of these Dr. Prain allows specific rank to six, assigning to the remaining Argemones a varietal position since the eleven species cited are of such unequal value. We thus are given six groups of forms or species, as shown by the key below. "The general characters derived from habit and foliage are somewhat variable in each, and certain of the forms simulate others in a remarkable manner. If these general characters are to be relied on there is nothing to be said against the view that would reduce the number of species of Argemone to two, viz: *A. fruticosa*, and a second composite and very variable species,"

The following key I give in translation:

KEY TO THE SPECIES AND VARIETIES OF ARGEMONE.

Shrubby; leaves holly-like; capsules opening almost to the base; (petals yellow).................................... **1. A. fruticosa Thurb.**

Herbaceous; leaves thistle-like; capsules opening a third from the top.

- Flowers yellow................................ **2. A. mexicana L.**
  - With hardly any style. Var. typica (*A. mexicana* L.)
  - With style distinct. Var. ochroleuca (*A. ochroleuca* Sweet).
- Flowers white:—
  - Bracts disposed along the floral branches:—Capsules spiny, with thin valves, horns of the sepals smaller..... **3. A. alba Lestib.**
  - Leaves and flowers smaller, spines spreading upward. Var. typica (*A. alba* Lestib).
  - Leaves and flowers larger, spines spreading downward. Var. glauca (*A. glauca* Nutt.)
- Capsules with thick coriaceous valves scarcely armed, horns of the sepals elongated..................... **4. A. grandiflora Sweet.**
- Bracts aggregated under the flowers:—
  - Capsules with their valves sparsely aculeate, horns of the sepals smooth without..................... **5. A. intermedia Sweet.**
  - Flowering branches elongated, horns of the sepals pyramidal. Var. typica (*A. intermedia* Sweet).
  - Flowering branches very short, horns of the sepals terete. Var. stenopetala (*A. stenopetala* Prain).
- Capsule with thick valves very densely aculeate, horns of the sepals aculeate without........... **6. A. platyceras Link & Otto).**
- Buds globose:—
  - Leaves and stem very spiny but glabrous, petals truncate at the apex. Var. typica (*A. platyceras* Link & Otto.)

Leaves and stem hispid, petals rounded at the apex. Var. hispida (*A. hispida* Gray).

Buds oblong. Var Chilensis (*A. rosea* Hook.)

Each species and variety is made clear by detailed and carefully written descriptions. The bibliography is appalling. The geographical distribution is completely outlined as shown by the localities of the specimens examined. Some idea of the painstaking exhaustive research is gained by looking over these references, also a lively knowledge of great confusion among the different forms of Argemone.

Space does not permit a review of any species except those in which western botanists are most interested. In the December number Dr. Prain discusses *A. platyceras* Link & Otto, *A. platyceras* var. *hispida* Gray and *A. intermedia* Sweet. *A. intermedia* Sweet appears to have remained confused with *A. platyceras* L. & O. in all works on North American Botany and yet it is the commonest Argemone of the prairies of Colorado and Nebraska. Dr. Prain says that when it has been found near the Mexican boundary it has been named *A. Mexicana* L, but *A. platyceras* Link & Otto when collected on the great plains. It was first described by James in 1823 under the name of *A. alba*; but as that name is preoccupied it has to take Sweet's name *A. intermedia* (1830). Under the impression that it was *A. platyceras* Link & Otto I called attention in *Zoe.* IV, 4, to the marked differences between it and *A. hispida* Gray which inhabits the same regions but is less common.

The common Argemone of California, which I have collected in Kern and San Benito counties, is similar to the hispid Argemone of Colorado except, as Professor Greene pointed out in Fl. Fran., p. 24, "for the short setose pubescence under the armature." In the Herbarium of the California Academy of Sciences there is a specimen from Kernville collected by Mrs. Brandegee which shows hispidity and Dr. Prain speaks of specimens in Durand's herbarium the most important being a piece of the plant collected by Heerman which is hispid.

The form which Prof. Greene describes as *A. munita* Durand, Mr. Coville in the Botany of the Death Valley Expedition determines rightly as *A. platyceras*, Link & Otto. So this Californian species is at last settled. *A. corymbosa* Greene, of which the type is in the herbarium of the California Academy of Sciences, is without doubt a form of *A. intermedia* Sweet. Mrs. Brandegee's reference of it to *A. platyceras* Link & Otto was due to the universal ignorance of *A. intermedia* Sweet and attendant confusion.

In Colorado, the two well marked species *A intermedia* Sweet and *A. platyceras* Link & Otto, var. *hispida* Gray have come under my observation.

In California there are at least three forms, viz: *A. platyceras* Link & Otto, *A. platyceras* var. *hispida* Gray and *A. intermedia* Sweet var. **corymbosa** (Greene).

Dr. Prain has done American botanists a great favor in so clearly setting forth the relationships of these confused Argemones and in giving the results of his researches in the European libraries and herbaria in such careful detail, and it is to be hoped that the monograph of the genus (which he leaves to American botanists) may some day be done as ably as he has cleared away the obstacles and prepared the way for it.

LICHENS OF THE VICINITY OF LOS ANGELES.—II.

By Dr. H. E. Hasse.

The following lichens from the vicinity of Los Angeles and from Catalina Island were identified by the late Dr. E. Stizenberger. The abbreviations, "S. M. R." and "S. B. R." indicate the Santa Monica Range and the San Bernardino Range of mountains.

Ramalina ceruchis (Ach.) DeNot., f. *cephalota*, Tuckerm. On shrubs near the coast, S. M. R.

R. homalea, Ach. On coast rocks, Point Dumas, S. M. R.

Parmelia conspersa (Ehrh.) Ach., var. *isidiata*, Lightf. On rocks, S. M. R.

Physcia pulverulenta (Schreb.) Nyl., var. *leucoleiptes*, Tuckerm. On trunks, S. M. R.

Peltigera canina (L.) Hoffm. On ground among mosses. Infrequent.

Pannaria lepidiota, Th. Fr. On shaded bank, Rubio Cañon, S. B. R.

P. lepidiota, Th. Fr., var. *cyanolepra*, Tuckerm. Infertile, S. M. R.

P. nigra (Huds.) Nyl. On stones, S. M. R. Frequent.

Collema pulposum (Bernh.) Nyl. On earth and rocks, S. M. R.

C. limosum. Ach. In same locality.

Lecanora subfusca (L.) Ach., var. *campestris*, Nyl. On trees, S. M. R.

L. subfusca (L.) Ach., var. *coilocarpa*, Ach. On rocks, S. M. R.

L. athroocarpa (Dub.) Nyl. On various trees, S. M. R. Abundant.

L. glaucocarpa (Wahl.) Ach. Oh rocks, S. M. R.

L. fuscata (Schrad.) Th. Fr., var. *oligocarpa*, Nyl. On rocks, S. M. R. Less frequent than the type.

L. privigna (Ach.) Nyl., var. *revertens*, Tuckerm. Mt. Echo. On quartz, S. B. R.

Rinodina Conradi, Koerb. On rocks, S. M. R.

Pertusaria flavicunda, Tuckerm. On coast rocks, Point Dumas, S. M. R.

Cladonia fimbriata (L.) Fr., var. *radiata*, Fr. On ground, S. M. R.

Biatora coarctata (Sm., Nyl.) On rocks and earth, S. M. R. Frequent.

B. Franciscana, Tuckerm. On sandstone, S. M. R.

B. cyrtella (Ach., Nyl.) On *Quercus* and *Juglans*, S. M. R.

Buellia petræa (Flot., Koerb.) Tuckerm., var *Montagnæi*, Tuckerm. On quartz rock, S. B. R.

B. stellulata (Tayl.) Br. & Rostr. On rocks, S. M. R.

Endocarpon hepaticum, Ach. On clay, S. M. R.

The following are from Catalina Island.

Ramalina homalea, Ach. On rocks exposed to ocean spray.

R. Menziesii, Tuckerm. On shrubs.

R. intermedia, Del. On shrubs. Infertile.

R. calicaris (L.) Fr., var. *farinacea*, Schær. On twigs. Infertile.

SHORT ARTICLES.

Tendril-Structures among the Algæ:—Many of the algæ, particularly the marine species, possess organs modified in such a way as to resemble very strikingly certain of those possessed by the more familiar flowering plants. The *Laminaria Sinclairii* of our coast possesses a very distinct creeping rhizome-like stem, sending up new leaves from time to time. Many algæ possess distinct organs very closely resembling true leaves, arranged upon the stem in regular order, and a certain number affix their branches and stems by tendril-like organs both to themselves and to other plants in a fashion closely resembling that adopted by various climbing phanerogamic species.

The writer's attention was called again and again to a habit of this kind possessed by a species of *Laurencia*, apparently *L. virgata* J. Ag., which he found growing in abundance about San Pedro, Cal. *L. virgata* sends out fairly long, stout branches abruptly curved at their tips, which coil about any slender object within easy reach. As many as six and seven turns were counted in some of these spiral attachments and the coils were fairly close and tight. These attachments were made by the various branches to branches of the same plant, to other plants of the same species, to neighboring slender algæ, and to the leaves of Phyllospadix.

By such means tangled masses of *L. virgata* were formed and when these were split up by the action of the waves, the detached portions continued fast and to thrive. One can readily see, also, how portions of such a mass, upon being torn away and floated off, may readily attach themselves anew and form the nucleus for a new growth. These tendril-like organs then, not only allow the plant to spread over other plants, but also to increase the number of individuals by purely vegetative processes.

Such organs exist also in *Cystoclonium purpurascens* var. *cirrhosa* Farlow, of the eastern coast. W. A. SETCHELL.

NEW STATIONS FOR TWO INTRODUCED PLANTS:—A recent collection of plants made by Mrs. Ellwood Cooper of Santa Barbara discovers two new weeds in that locality, viz: *Erigeron linifolius* Willd. and *Artemisia biennis* Willd. The former has not before been reported from California though found by the writer at Bakersfield in September, 1893. The latter is recorded in the "Botany of the Bay Region" as growing "mostly in or near cultivated fields, at West Berkeley, etc."

ALICE EASTWOOD.

ARBUTUS MENZIESII IN SAN FRANCISCO COUNTY:—At present there is no record of the existence of *Arbutus Menziesii* Pursh. in a native state in the County of San Francisco. Dr. Behr remembers one tree that grew in a thicket of *Quercus agrifolia*, *Heteromeles arbutifolia*, etc. covering a sandy ridge bordering a marsh in the neighborhood of where Seventh and Harrison streets now come together.

Near Lake Merced there is a solitary tree dwarfed and weather-beaten, probably the only one now growing wild in the county. It is a sorry specimen hardly to be distinguished from the surrounding brush. Last year it bloomed, but this year there is not a sign of a flower bud. It was first noticed by Miss Cannon in 1894. ALICE EASTWOOD.

MISCELLANEOUS NOTES AND NEWS.

THE last "Beiblatt" (No. 7.) of the cryptogamic journal *Hedwigia*, just issued, contains an index of all new fungi (both genera and species) published between the date of issue of the last volume of Saccardo's Sylloge Fungorum and January 1, 1896. Forty-three new species are listed from California. The Agarics head the list with nineteen species and the Fungi Imperfecti (Sphæropsideæ and Hyphomycetes) follow with thirteen, the Gasteromycetes have two new species, the Pyrenomycetes and the Myxomycetes three each, and the Uredineæ, Peronosporeæ and the Chytrideæ one each. The work done at present upon our Californian species, seems to be chiefly the collecting of material and sending it away to be determined, thus bringing into existence a host of names, new and old, fastened upon our territory, which will be just one more obstacle in the way of the student who may at some time be willing to go more slowly and more surely in studying our species from a developmental point of view.

A POPULAR edition of Sir John Lubbock's "A Contribution to our Knowledge of Seedlings" has been issued by Kegan, Paul & Co., London, England. To those who desire to become acquainted with the conclusions arrived at by the author this edition will doubtless be welcome.

A PORTRAIT of Professor A. Cogniaux of Verviers, Belgium, appeared in the *Journal des Orchidées* for February 16. M. Cogniaux who is well known as an authority on the Cucurbitaceæ and Melastomaceæ, and who has issued monographs of these orders, is now devoting his energies to the Orchidaceæ.

THE DEATH is announced of Prof. M. Lawson of Madras, formerly Professor of Botany at Oxford University, and a contributor to Hooker's *Flora of British India*.

THE *Bulletin de L'Herbier Boissier* for February publishes a portrait of the late Jean Muller, the lichenologist, accompanied by a notice of his life and works.

NOTES ON THE POLLINATION OF SOME CALIFORNIAN MOUNTAIN FLOWERS.

By Alice J. Merritt.

These notes were taken during July and August of the past summer in Bear Valley, San Bernardino Co., California. The observations were made mainly in the vicinity of Knight's Hotel near the artificial lake formed by the Bear Valley dam. The altitude is about 6600 feet. Besides the moist lands of the main valley there are tributary "cienegas" with abundant springs and streams. The flora of these meadow lands and the adjacent pine regions is varied and abundant throughout the summer. Many of the flowers were subject to daily observations, others were noted only in passing, but the notes were always taken on the spot and the bees were with few exceptions captured on the flowers. I am not sufficiently versed in entomology to attempt identification of all of the insect visitors. For the names of the bees I am indebted to Dr. A. Davidson. The flowers whose names I was unable to determine have been referred to Mr. S. B. Parish for identification.

Ranunculus canus, Benth, is abundant in moist places throughout the summer. The flowers differ little from those of *R. Californicus* except that the scales protecting the nectar are longer—so long that the nectar is not visible and therefore does not advertise itself as it does in the other species by glistening in the sunlight. But the flowers' habit of turning to the sun is at least useful in making the polished petals more conspicuous. The flowers open soon after sunrise, and remain open until about 5 p. m. When the flowers first expand the stigmas are mature and are fully exposed. Flowers kept in water in the house remain in this condition most of the first day, then the inner anthers rise and loosely invest the stigmas, while the outer stamens begin shedding pollen away from the stigmas. The dehiscence proceeds slowly—lasting six days in the house—and the anthers fall back from the stigmas as they dehisce. I have never been able to detect a clear case of pollen falling naturally on the stigmas. In the field the stigmas seem past maturity soon after dehiscence begins, but in the house they remain fresh until the petals fall. In the first stages of the flower, then, only cross-pollination is possible, then for a variable period close-pollination may result if the visiting insect does not alight on the centre of the flower. In the early morning there are usually many little flies on the flowers, and they are quite as likely to alight on the petals as on the stigmas. Later in the forenoon I usually found small bees, Melissodes and Megachiles, and sometimes small butterflies getting nectar from the flowers. The bees and butterflies invariably alighted on the centre and made the entire circuit of the nectaries. In doing this they must of course double themselves over the ring of stamens and sweep quite around it, becoming thoroughly dusted with pollen. In the afternoon insect visits were usually precluded by high winds, though I occasionally found beetles on the flowers. The plants fruit abundantly.

RANUNCULUS CYMBALARIA, Pursh, has small inconspicuous flowers that secrete little nectar. The scales are small. The stigmas seem mature throughout the flower's existence. Dehiscence begins with the outer stamens, but they take an ascending position, and the anther cells open so widely that the anthers become little pollen-covered balls. The inner anthers during dehiscence are so nearly erect that any slight disturbance must send them against the column of stigmas. The flowers are sometimes frequented by thrips which must effect close- more frequently than cross-pollination. I have seen large areas fairly carpeted with these plants, but have seen no guests other than thrips.

AQUILEGIA TRUNCATA, F. & M., is common along streams throughout the mountains and is still in full flower in July, but I had opportunity to observe only scattered plants. The showy scarlet flowers have spurred petals from nine lines to an inch long, but not wide enough to admit the head of a large bee. Nectar is abundant in the incurved tips of the spurs. The anthers are at first compactly arranged about the column of carpels, but as the filaments lengthen the outer ones recurve so that there is now a column ten lines or so long of loosely arranged anthers, only those at the tip—i. e., those farthest downward, since the flowers are pendent—shedding pollen. The inner filaments gradually straighten and lengthen so that the dehiscing anthers always occupy the end position. During this process the styles also lengthen, but in all the flowers I observed the minute stigmas at their tips did not mature until they were quite beyond the anthers, and the pollen was nearly or quite gone, so that self-pollination was impossible. *Bombus Californicus* visited the flowers frequently for pollen, but would of course only rarely visit those with mature stigmas. I have never seen bees of any sort attempt to obtain the nectar in a legitimate way but have seen a large species of Xyllocopa pierce the spurs four or five lines above the tips and so steal the nectar. So the pollination of these flowers by bees is very uncertain. They seem adapted to agents with longer tongues, and I was much gratified to have this theory supported on three different occasions by the visits of humming birds to the flowers. Where these plants grow in masses, judging from experience with other scarlet flowers, I should expect to see them frequently visited by humming birds.

ARGEMONE HISPIDA, Gray. Very vigorous plants with large, showy flowers are met occasionally in river washes about the valley. I have observed them only in passing. The large and numerous anthers are covered with pollen when the flowers expand. The five stigmatic surfaces are also mature and are not high enough to escape self-pollination, which is sure to occur. But the flowers, although providing no nectar, seem to be favorites with the bees—the ubiquitous *Bombus Californicus*, particularly, fairly wallows in the pollen and must effect cross pollination as he enters the flowers. The flowers are of short duration, the anthers often falling before noon of the first day.

NOTE ON CALYPSO BOREALIS, SALISB.

By J. Burtt Davy.

The "Botany of California" gives as the habitat and range of this plant "in bogs * * * in the the mountains of Mendocino Co., very rare (*Miller*, *Vasey*); more common in Oregon and Colorado, thence through British America and along the northern border of the Atlantic States." In March, 1895, Miss Atterbury collected it at Cazadero, Sonoma Co., Calif., and on March 14 and 15 last, I found thirteen flowering specimens and several without blossom, in the same locality. My specimens were not growing in *bogs*, however, but on a well-drained hillside in the deep shade of the virgin redwood forest; and in all but three cases they were confined to the rich humus of decaying leaves of Sequoia. As far as I could ascertain, the few roots, abundantly clothed with root-hairs, did not penetrate the clay soil beneath the shallow layer of redwood leaves, and in the three cases where the plants grew directly out of clayey soil, it might easily have been owing to the artificial scattering of soil over them, as they were close to the side of the county road.

In *Bot. Mag.* LIV. t. 2763, Hooker says of Calypso "lip large, pendent, ovato-oblong, remarkably concave, inflated, slipper-shaped, pale reddish-brown, with dark dots placed in lines; below, it terminates in two tooth-like points, and these are, above, covered by a pale, almost whitish lamina, having a tuft of yellow hairs at the base, and a few brown spots: it is sometimes as long as, sometimes shorter than, the two teeth, sometimes bifid at the point, at other times as in the present specimens quite entire. * * * I have, on a former occasion [1] stated it as my opinion, that the American and European Calypsos should only be considered as one species, and the present figures, drawn from living plants sent from Montreal by Mr. Cleghorn, seem to confirm this opinion, having the two teeth of the labellum as short, if not shorter than the lamina, which has been given by Mr. Brown as the essential character of the European plant. Sprengel again,[2] relying probably on my figures in *Exotic Flora*, has made a principal character of the *C. Americana* to depend on the bifid lamina; but in the present individuals that is quite entire, as in Swartz's figure."[3]

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[1] *Exotic Flora* 12 t 12.

Miss Eastwood, who has kindly furnished the above extract, says:—"An examination of the specimens in the herbarium of the California Academy of Sciences shows that all those from the Pacific Coast have the two teeth of the labellum longer than the lamina, and very prominently projecting, while the specimens from the mountains of Colorado and one specimen from Europe have the lamina entirely covering the two teeth. The specimens from the Pacific Coast are:—Washington; Seattle, May, 1892 (*C. V. Piper*): Oregon; Salem (*J. V. B. Smith*); Portland, 1869 (*Harford & Dunn*); Applegate Valley, Jackson Co. (*H. L. Durden*): California; Mt. Tamalpais, near Larsen's, Marin Co. (*Mrs. C. Bonestell*). Dr. Behr says that Dr. Kellogg found it on Mt. St. Helena: specimens in the herbarium, marked C. borealis in Dr. Kellogg's writing, without locality, probably came from there. The specimens from Colorado are: Hall & Harbour, 1862, No. 537; Palmer Lake (*A. Eastwood*, 1890). The specimen from Europe is No. 629 ex herb. Floræ Ingricae (Finland)."

My Cazadero plants show great variability in the proportionate length of the lateral and median lobes of the labellum, and in the depth of division of the median lobe. In some cases the connate lateral lobes (the "lamina") are decidedly shorter than the saccate median lobe, in other cases the reverse condition exists; I did not notice before drying my specimens, whether the "lamina" was in all cases entire, but it certainly was in those of three flowers; again, in some cases the median lobe is deeply bifid, with spreading teeth, in other examples it is almost entire. Specimens in the herbarium of the University of California, from Sandberg, collected in "deep ravines, Thomson, Minn." appear to differ likewise, in the relative length of the lateral and median lobes. The color of the tuft of hairs on the latter, in the Minnesota plants is bright yellow, while in those collected by Dr. Kellogg in Mendocino Co. (in herb. Univ. Calif.), and in mine, these hairs are merely white, with no trace of yellow, and appear moreover, to be longer, though sparser, than in the Minnesota plants.

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[2] *Syst. Veg.* iii. 733.

[3] *Svensk. Bot.* t. 518.

LICHENS OF THE VICINITY OF LOS ANGELES.—III.

By Dr. H. E. Hasse.

Usnea barbata (L.) Fr., var. *hirta*, Fr. On twigs. Infertile.

Theloschistes parietinus (L.) Norm., forma *terrestris*. On moist coast rocks.

Parmelia conspersa (Ehrh.) Ach. On ground and rocks. Common.

Physcia stellaris (L.) var. *aipolia*, Nyl. On rocks. Common.

Endocarpiscum Guepini (Delis.) Nyl. On earth.

Placodium murorum (Hoffm.) DC. On rocks.

P. murorum (Hoffm.) DC., var. *gyalolechioides*, Muell. On moist coast rocks.

P. aurantiacum (Lightf.) Naeg. & Hepp. On *Quercus*, etc. Not rare.

P. ferrugineum (Huds.) Hepp. On various shrubs.

Lecanora muralis (Schreb.) Schær. On rocks.

L. pallida (Schreb.) Schær., var. *cancriformis*, Tuckerm. Frequent, on *Heteromeles* and other shrubs.

L. Cenisia, Ach. On earth. Apparently infrequent.

L. Hageni, Ach. On rocks.

L. atra (Huds.) Ach. On rocks.

L. badia (Pers.) Ach. On rocks.

L. athroocarpa (Dub.) Nyl. On various barks. Frequent.

L. subfusca (L.) Ach. On barks. Frequent.

L. cinerea (L.) Sommerf. var. *gibbosa*, Nyl. On rocks. Apparently infrequent.

L. xanthophana, Nyl. On rocks.

L. privigna (Ach.) Nyl. On rocks.

L. redimita, Stiz., *n. sp.* Thallus tartareous, light to dark ashcolored; apothecia $\frac{1}{2}$ to 1 line in diameter, numerous, elevated, when young covered by the scurfy thallus, which finally remains as a pruinose covering on the blackening, convex disk. Thalline margin crenate, eventually disappearing. Spores $\frac{24-28}{6-10}\mu$, somewhat curved, 4-5 septate. Cl—. I+ dark blue, changing to brown; K—. Akin to *L. elatina*, Ach. On *Rhus laurina*. I have recently found this to be quite frequent on *Umbellularia Californica* and *Alnus rhombifolia* in Cañon del Gusto, S. M. R.

Pannaria microphylla (Sw.) Del. On ground.

Rinodina Conradi, Koerb. On rocks and ground.

R. angelica, Stiz. On rocks.

R. succedens, Nyl. On various barks.

R. sophodes (Ach.) Nyl., forma. On decaying caudex of *Cotyledon*.

Urceolaria scruposa (L.) Nyl. On earth.

U. gypsacea, Nyl. On earth. Infrequent.

Cladonia pyxidata (L.) Fr. On earth. Common.

C. fimbriata (L.) Fr. On earth, shaded banks.

C. fimbriata (L.) Fr., var. *tubæformis*, Fr. On shaded earth.

C. fimbriata (L.) Fr., var. *subcornuta*, Nyl. On shaded earth.

Biatora coarctata (Sm., Nyl.) On rocks and ground.

B. Naegelii, Hepp. On various shrubs. Quite frequent.

B. mixta, Fr. On shrubs.

B. phæophora, Stiz., *n. sp.* Apothecia in groups, dun-colored, convex, the thin margin disappearing. Spores ovoid, ellipsoid, $\frac{12-14}{7}\mu$, hypothecium colorless, heads of paraphyses faintly yellow. Hym. gel. I+ dark blue, Cl—, K—. On slate rock.

Lecidea enteroleuca, Fr. On rocks.

L. enteroleuca, Fr., var. *flavida*, Fr., Stenh. On rocks.

L. squalida (Schleich.) Ach., var. *caulescens*, Nyl.

L. aromatica (Sw.) Ach.

L. sylvana (Koerb.) On dead twigs.

L. lapicida, Fr., var. *declinascens*, Nyl. On rocks.

L. platycarpa, Ach. On rocks.

Buellia oidalea, Tuckerm. On various barks.

B. oidalea, Tuckerm., var *penichra*, Tuckerm. On *Quercus*.

B. parasema (Ach.) Th. Fr. On various barks.

B. petræa (Flot., Koerb.) Tuckerm. On rocks.

B. halonia (Ach.) Tuckerm.

B. stellulata (Tayl.) Br. & Rostr. On rocks.

Lecanactis Californica, Tuckerm. On *Quercus*.

Arthonia radiata, Willey. On *Quercus*.

A. dispersa (Schrad.) Nyl.. var. *tetramera*, Stiz. On *Quercus*.

A. dispersa (Schrad.) Nyl., var. *cytisii*, Mass. On *Quercus*.

A. stictella, Stiz. On bark.

A. orbolifera, Ach. On *Heteromeles*. Apparently not frequent.

A. anastomosans, Ach. On various barks.

THE FRUIT OF TROPIDOCARPUM.

By B. L. Robinson.

No genus of North American *Cruciferæ* presents such peculiar difficulties in its specific subdivision as *Tropidocarpum.* The vegetative characters of stature, degree of branching, division of leaves, &c., as in most annuals of this order, are highly variable and so evidently influenced by the individual environment as to be thoroughly unsatisfactory as specific distinctions. Nor have the inflorescence and floral envelopes yielded any good basis for the separation or limitation of species. It is true the pedicels vary somewhat in length and curvature. The petals are sometimes golden yellow, more often pale yellow, and sometimes salmon-colored or even roseate. The sepals are hirsutulous or sometimes smoothish. Yet here as in the foliage the variation appears to be gradual and of the formal sort, in which each member is modified independently of every other.

With the fruit, however, the variations are more considerable and the differences (at least at first sight) appear to be those of kind rather than degree. The critical investigation of these differences is of much importance in estimating the value of the existing species, and indeed some of the capsules form such noteworthy exceptions to the general fruit structure of the order, that, quite apart from their immediate systematic bearing, they merit detailed description. It is impossible with the limited material at hand to treat the subject as thoroughly as it deserves, yet it is hoped that the present notes may draw attention to the peculiar anomalies of the group and that some one so situated that he can make field studies or cultures may continue the observation of the genus. Besides the material in the Gray Herbarium, the writer has been permitted to examine the entire representation of *Tropidocarpum* from the Herbarium of Columbia College, the California Academy of Sciences, and the Herbarium of the University of California, and for this privilege wishes here to express his cordial thanks to Prof. Britton, Miss Eastwood, Prof. Setchell and Mr. Jepson. Mr. J. W. Blankinship has also kindly lent for study a number of specimens from his private herbarium.

There are four chief types of fruit to be distinguished in the genus, which may be called the *gracile*, *dubium*, *rhombic*, and *capparideum* types. The first (Fig. 1) is the most frequent form of fruit. It is a linear elongated 2-valved, 2-celled strongly obcompressed capsule with carinate or rather conduplicate valves and a narrow complete partition. From the peculiar form of the valves, a cross-section of this type of capsule (Fig. 6) much resembles a double bow knot. The second, or *dubium* type (Fig. 2), is also linear and 2-valved, but is not uniform throughout its length. While the upper part is obcompressed and has conduplicate valves, a change occurs somewhere in the pod (often although not always a little above the middle), and the lower portion is somewhat compressed laterally, with valves more or less flattened and only slightly carinate. At the point (Fig. 2, a) where this change occurs, the valves and replum not infrequently undergo a torsion of about 90°, which brings the slight keel of the lower portion of the valves (Fig. 2, c) just beneath and almost continuous with the replum of the upper portion (Fig. 2, b). The result of this torsion is to preserve to a great extent the flatness of the pod throughout its entire length. In cases where no torsion occurs the upper part of the pod being obcompressed is out of plane with the lower part, which is to some extent laterally compressed. When the torsion occurs it is doubtless a mechanical adjustment of tension in growth and naturally coincides accurately with the change in the form of the valves. So neatly can this change take place, that it sometimes requires a rather close inspection of a capsule of this kind to be sure that the median line, which in the upper part represents the replum, in the lower marks the middle of a valve. If such a capsule be examined in cross-section it will be found that the part above the point of change is 2-celled (with section similar to that shown in Fig. 6), while the lower portion is somewhat rhombic in section and completely destitute of partition. If the valves are removed it will be seen that at the point where the change in the valves occurs, the two sides of the replum (Fig. 4) suddenly diverge, so that, instead of being separated only by the thickness of the pod, they are separated by its whole breadth. Both the upper and the lower parts of the pods bear ovules and mature seeds, which are similar so far as observed. The third or *rhombic* type (Fig. 14) is linear, elongated and 2-valved, but completely unicellular and flattened laterally throughout, so that the valves, instead of being conduplicate, are scarcely carinate. The cross-section of this capsule is rhombic as shown in Fig. 7, but is often more strongly flattened. The fourth or *capparideum* type of fruit (Fig. 5), is shorter and considerably broader. It is not strongly compressed, but is 4-valved and, except at the very base, devoid of septum. There are four placentæ, all maturing seeds.

It will be noted that of the four kinds of capsule described, each has a characteristic replum. In the *gracile* type, after the falling of the valves, the replum (Fig. 3) is seen to consist of two closely approximate and essentially parallel columns bearing a complete and very narrow septum. In the *dubium* type the upper portion of the replum (Fig. 4, a) is exactly as in the *gracile* type, while in the lower portion (Fig. 4, b) the two columns are farther apart and bear no septum. In the rhombic type the replum (Fig. 15) consists of two parallel columns united merely at the base and summit, and bearing no septum. In the *capparideum* type the replum (Fig. 8) is formed of four similar columns united at base and summit, and also without septum. It thus happens that even after the dehiscence of the capsules the repla, which are so characteristic, indicate accurately the nature of the fruit.

As these four types of capsules are so striking, it is only natural that they should have been eagerly taken as furnishing excellent specific characters in a group where other distinctions were so poor. Yet it is very important, before giving classificatory weight to these fruit characters, to be sure that they have a reasonable constancy and are not due to teratogenic influences. Possible intergradations should be sought and the material at hand shows that they are by no means lacking. Especially the *dubium* type[1] varies greatly in different capsules, according as the change in the valves and replum occurs near the summit (as in Fig. 13) or near the base. In the latter case the capsule resembles and gradually passes into the *gracile* type, in the former, the *rhombic* type. So that the *dubium* type furnishes a very complete series of transitions between them. But the variation does not stop here, for further modifications furnish equally good transitions to the fourth or *capparideum* type. It will be observed that the *rhombic* type scarcely differs from the *capparideum* type except in being 2-valved instead of 4-valved. But capsules with three valves are by no means rare. The third valve is sometimes very small and extends only a fourth or half the length of the pod, one of the repla being split only to that extent (Fig. 10, a), or sometimes the third valve, while extending the full length of the pod, is narrower than the other two, or finally the three valves are equal and regular (Fig. 18). In a similar way through the partial division of the other column of the replum a more or less rudimentary or incomplete fourth valve sometimes appears (Fig. 12, e, shows the replum of such a pod), thus rendering the transition from the 2-valved to the 4-valved type very complete.

Having thus described at some length the different forms of capsules, we may proceed to their occurence. The *gracile* type, as has been said, is the most common. It varies greatly in size and pubescence, but less than any of the others in its structure. The majority of plants, which have reached our collections have fruit uniformly of this type, and there is every reason to regard it as the normal fruit of the genus. With the other types there seems to be much less stability of form, and where any of them occur at all, it is not unusual to find two or more of them associated upon the same individual. Noteworthy examples of this variation upon the same individual may be seen in figures 9 and 12. In figure 9, pod *a* is of the *gracile* type; pods *b* and *g* are of the *dubium* type; pod *d*, of the *rhombic* type; while pods *e* and *f* are 3-valved (a fact not very easily shown in the drawing); and pod *i* is of the 4-valved or *capparideum* type. In figure 12 we have a very similar inflorescence, with the persisting repla after the falling of the valves. Of these repla, *a* is of the *gracile* type, *b*, *c* and *d* of the *dubium* type, while *e* and *f* are partially 3-valved, and *g* partially 4-valved, thus closely approaching the *capparideum* type.

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[1] So called because characteristic of *T. dubium*, Davidson, Erythea, ii, 179.

As the different types occur thus upon the same individuals it is quite impossible to ascribe much value to them in the separation of species. It is certainly true that specimens of the so called *T. capparideum*, Greene, with mostly short thickish pods, look strikingly different from any of the other proposed species, yet close scrutiny shows in almost all plants, examined by the writer, that there are one or more 2-valved and rather frequent 3-valved pods associated with the 4-valved. There are of course many individuals in which the capsules are *prevailingly* of the *dubium*, the *rhombic*, or the *capparideum* type. The question naturally arising is, if these are not species, what is their status? Are they merely marked forms or teratological states of *T. gracile*, Hook.? The chief evidences against this view are that they occur in great numbers and appear to bear perfect seeds, which may very well "come true" and produce like individuals, although this remains to be proved. On the other hand there are several things to suggest monstrosity. First, there is the inherent variability in all forms of the capsules except the *gracile* type, a variability not only in different plants but shown so notably in the successive fruits of the same individual. Then it is possible, as we have seen, by the comparison of the different kinds of capsule, to derive capsules of the *dubium*, *rhombic* and *capparideum* types by a gradual series of modifications or deformations of a capsule of the *gracile* type, and a noteworthy proof that this is not merely a theoretical series, but represents the real mode of origin of the more complicated pods, is shown by such individuals as are represented in figures 9 and 12. For at the base of the inflorescence in these cases we have pods of the *gracile* type, while above them we find the same gradual series of changes in the fruit, which have been described at length, and which lead at the summit to the 4-valved, unicellular *capparideum* type.

Perhaps, however, the most curious and significant mark of monstrosity remains to be mentioned, namely, the small inner capsule not infrequently developed in the pods of the *capparideum* type. The so-called *T. capparideum*, Greene, appears to have been collected first at Lathrop, Calif., by Mr. Lemmon. Some of his plants were referred to Drs. Gray and Watson, who regarded them as monstrous forms of *T. gracile*, Hook. Dr. Watson, noting the interesting nature of the internal capsules, sent some of the material to Mr. Masters, and a rough figure and brief description of such a capsule were published in the *Gardeners' Chronicle*, new (2nd) ser. xvii. 11, f. 1. In revising the genus for the *Synoptical Flora*, the writer observed on four individual plants secured by three different collectors, no less than fifteen instances of these small pods, in various degrees of development, inclosed in the larger fruits. Upon these observations, it was stated that the capsules of *T. capparideum* commonly contained near the base a small capsule-like structure.

From the facts here presented, the reader will be in a position to judge of the merits of the following portion of Prof. Greene's recent *Revision of Tropidocarpum*.[1] "It [*T. capparideum*] has invariably a 4-valved pod and 4 placentæ. The valves separate from the placentæ beginning at the top, just as in the capparids, and when all four of the valves have fallen away, the four placentæ joined together at the summit remain in place, quite as in certain genera of *Papaveraceæ*. The pods are constantly devoid of every trace of a partition, and there is not the least suggestion of anything anomalous about the plant. In its locality it is even more abundant than any other species, and less disposed to vary than is the typical species of the genus. The statement in the *Synoptical Flora*, p. 141, as to the capsules commonly containing a small capsule-like structure at base, is based on a single instance. Dr. Robinson's imagination would seem to have led him to guess that this malformation may be common. I alone have seen more of this plant than have all other botanists, by at least tenfold, and am prepared to say that no species of the genus is less variable in its fruit, or more constant in all its excellent specific characters."

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[1] Proc. Acad. Nat. Sci., Phila., 1895, 554.

As several others have collected *T. capparideum* at the type locality and in the neighboring regions, it is not easy to admit the superior opportunities of observation, which Prof. Greene claims to have enjoyed; but even if they are granted he seems to have made wofully poor use of them, if he has overlooked all the interesting variations in the number and form of the valves, and the presence of the inner capsule, so often exhibited.

Two sheets of material of Prof. Greene's own collecting, from the type locality, have been examined by the writer and show occasional 2-valved capsules and the presence in some instances of the inner capsule. Indeed the excellently developed one, shown in Fig. 16, grew upon a specimen of Prof. Greene's collecting.

Regarding the structure and morphology of the internal capsule there is doubtless much still to be learned. A few facts, however, can be given. It appears to occur only in capsules which have three or four valves. It is itself quite variable in size, from the merest obscure rudiment to a capsule half the length of the outer pod. It is, so far as observed, always 2-valved, with strongly convex valves and a complete or nearly complete partition. When well developed it contains about two seeds, which mature in just the same way as those in the surrounding capsule, taking on the same dark brown color and having the same firm testa and mucilaginous envelope, which swells on contact with water. Within the seed is an apparently perfect embryo with normally incumbent thickish cotyledons. In fact, in no feature observed, do the seeds of the inner capsule differ from those of the outer ones. The manner in which the fertilization of these seeds is accomplished (if fertilized they are) is a difficult and most interesting problem. It is possible of course that some of the pollen tubes entering the outer capsule penetrate the style of the inner capsule,—this, however, could only be proved by skillful investigation with copious material representing just the right stages. The inner capsules are mostly axial or nearly so in their position although they sometimes arise from one of the placentæ near the base of the outer capsule. They probably represent a second whorl of carpellary leaves. The inner capsules, when well developed, dehisce at maturity with much regularity as shown in Figure 17. The culture of the seeds, borne in these internal pods, offers to those, who can procure them in a fresh state, much of interest. By such cultures alone can their possible fertility be demonstrated.

Searching in literature for mention of similar phenomena the writer has found in a paper by Peyritsch[1] the description of closely analogous deformities in the fruit of *Draba alpina*, L. In teratological specimens of this plant, investigated by Peyritsch, there were found 3-valved and 4-valved capsules, and in them very commonly were contained 2-valved pods arising as outgrowths of the placentæ. Our figure 19 has been redrawn from one by Peyritsch,[2] showing one of these double capsules of *Draba alpina*. The reader will have no difficulty in seeing the close structural resemblance between this case and that of *Tropidocarpum capparideum*. Very similar phenomena have been observed in *Cheiranthus Cheiri*, and the occurrence of 3-carpelled and 4-carpelled pods is by no means infrequent in a number of cruciferous genera, indeed in some of the western and Siberian forms of *Nasturtium terrestre*, R.Br., 3-4-carpelled pods are quite as common as the 2-carpelled.

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[1] Pringsheim's Jahrbuch, viii. 119–121.

[2] Peyritsch, l. c., t. 7, fig 7.

One feature of the *Tropidocarpum* fruit remains to be noted, namely the pubescence. The pods of the *gracile* type are usually hispid with short reflexed hairs (although rarely smoothish) but this pubescence disappears about in proportion to the divergence of form from the *gracile* type. We cannot, however, lay much stress upon this character. If the changes in the form of the capsules are in reality due to teratogenic influence, the gradual loss of pubescence may result from the same unknown cause. Loss of pubescence in deformed structures is, we believe, by no means rare. It is impossible yet to say just what part teratology plays in the modification of the *Tropidocarpum* capsules, and opinions on this point may differ widely, yet it is certain, from the facts at hand, that any systematic treatment of the genus, which wholly neglects this erratic element in variation, is not likely to give us the "still much needed" critical revision of the species.

EXPLANATION OF PLATE.

Fig. 1. Capsule of *T. gracile*, Hook., from specimens in Herb. Gray, collected at Antioch, Calif, by Mrs. T. S. Brandegee.

Fig. 2. Capsule of the "dubium type," from specimens in Herb. Gray, collected at Los Angeles, by J. C. Nevin. *a.* Point of change in the valves. *b.* Edge of the replum. *c.* Mid-rib of the valves.

Fig. 3. Replum and septum of *T. gracile*, Hook, from specimens in Herb. Calif. Acad., collected at Bitterwater, by Miss Alice Eastwood.

Fig. 4. Replum and partial septum of a pod of the "dubium-type," secured at the same place and by the same collector. *a.* Narrow septum in the upper obcompressed portion of the capsule. *b.* Column of the replum in the lower unicellular laterally compressed portion.

Fig. 5. Four-valved capsule of *T. capparideum*, Greene, from specimens in Herb. Gray, collected at Lathrop, Calif., by J. G. Lemmon.

Fig. 6. Cross-section of capsule of *T. gracile*, Hook., collected at Marysville Buttes, by J. W. Blankinship.

Fig. 7. Cross-section of a capsule of the "rhombic-type" from specimen collected at Fresno, Calif., by Miss Eastwood. The placentæ lie in the acute angles.

Fig. 8. Replum of a 4-valved capsule of *T. capparideum*, Greene, from specimen in Herb. Gray, collected at Byron, by Mrs. Brandegee. *a*. Rudimentary inner pod.

Fig. 9. Fruiting raceme with mixed fruit, from specimen collected at Tracy, by Messrs. Michener and Bioletti. *a*. Pod of the "gracile-type." *b. g*. Pods of the "dubium-type." *d*. Pod of the "rhombic-type." *e. f. h*. Pods with 3 valves. *i*. Pod with 4 valves ("capparideum-type.")

Fig. 10. Repla of two successive capsules on a specimen in Herb. Gray, collected at Byron, by Mrs. Brandegee. *a*. Imperfectly 3-valved capsule, with rudiment of inner pod at base. *b*. Completely 4-valved capsule, also with rudiment of inner capsule.

Fig. 11. Young plant of *T. capparideum*, Greene, from Herb. Univ. California, collected at Clayton, Calif., by J. Burtt Davy. *a. c*. Pods with but 3 valves. *b*. Pod with 4 valves.

Fig. 12. Old inflorescence with repla of mixed types, from specimen in Herb. Calif. Acad., collected at Tracy, by Mrs. Brandegee. *a*. Replum of the "gracile-type." Above this are two pedicels bearing broken repla. *b*. Repla of the "dubium-type." *c. d*. Repla of imperfectly 3-valved capsules. *e*. Replum of an imperfectly 4-valved capsule.

Fig. 13. Pod of the "dubium-type" in which the change of compression occurs near the summit, from specimen in Herb. Calif. Acad., collected at Fresno by Miss Eastwood.

Fig. 14. Pod of the "rhombic-type," unicellular and laterally compressed throughout, collected with the last.

Fig. 15. Replum of the "rhombic-type," from same plant as the last.

Fig. 16. Capsule of *T. capparideum*, with one valve removed, and showing within an unusually large internal capsule. From specimen in Herb. Columbia Coll., collected at Byron Springs by Prof. Greene.

Fig. 17. Base of replum and mature dehiscent internal pod, from specimen in Herb. Gray, collected at Byron, by Mrs. Brandegee. The outlines of the two seeds show through the valves.

Fig. 18. Pod from the same plant with 3 valves, 2 of them already removed. *a*. Remaining valve. *b*. Internal capsule, unusual in arising from one of the placentæ instead of being axial.

Fig. 19. Capsule of *Draba alpina*, L. with 4 valves, 4 placentæ, and containing a 2-valved internal capsule. Redrawn from figure by Peyritsch in Pringsheim's Jahrbuch, vol. viii. t. 7.

Figures 1 to 18 drawn from nature by the author.

Gray Herbarium, Cambridge, Mass., April 18th, 1896.

NEW CYANOPHYCEÆ.

By Frank S. Collins.

Anabæna catenula (Kuetz.) Born. & Flah. var **Americana**, n. var. Spores 30–60 μ long, strictly cylindrical.

The typical form, with spores 16-30 μ long and constricted at the middle, occurs throughout Europe, but has not yet been found in America; the difference between our form and the European seems to be constant, but not of specific value. The trichomes vary from 5 to 8 μ in diameter, and the cells vary, probably according to age and activity of cell division, from cylindrical with rounded ends and about twice as long as thick, to compressed spherical with length slightly less than the diameter. The full range of variation, both as to size and shape, may be seen in the same collection, and when extreme forms come side by side, they would seem to be distinct species; all intermediate forms, however, can be found. The form with cylindrical cells comes very near the description of *A. Felisii* (Meneg.) Born. & Flah., of which I have not seen specimens.

Found in May and June, among various algæ forming a scum in ditches, Middlesex Fells, Malden, Mass. To be distributed under No. 207, Phycotheca Boreali-Americana, Collins, Holden & Setchell.

Anabæna (Sphærozyga) Bornetiana n. sp. Trichomes straight or somewhat flexuous, 12μ diam.; cells spherical or slightly shorter than their diameter; heterocysts 13–14μ diam., spherical or occasionally oblong, 13–20μ long; spores on each side of the heterocyst, 15–20μ diam., 50–90μ long, cylindrical or more commonly tapering slightly from the middle to the rounded ends; epispore smooth, translucent.

This species somewhat resembles *A. catenula*, which, however, is in the subgenus *Dolichospermum*, the spores occupying no definite position in relation to the heterocysts. Moreover the dimensions of *A. Bornetiana* are nearly double those of *A. catenula*, and also much exceed those of any hitherto described species in the subgenus *Sphærozyga*. The very regular trichomes, with rather dark blue-green cells and spores, and yellowish translucent heterocysts, make it quite a striking plant, perhaps the handsomest of the genus; I take pleasure in dedicating it to Dr. Edouard Bornet, to whom I am much indebted for assistance in the determination of the Cyanophyceæ.

Found in May and June among various algæ, forming floating masses or scums in ditches, Middlesex Fells, Malden and Medford, Mass.; not as a distinct stratum, but as rather scattered filaments. To be distributed under No. 208, Phycotheca Boreali-Americana, Collins, Holden & Setchell.

Cylindrospermum minutissimum n. sp. Trichomes straight, forming a loose ærugineous stratum; vegetative cells cylindrical, very slender, 2–2. 5μ diam., about twice as long; heterocysts cylindric-oblong, 4μ diam., 7–8μ long; spores 8–9μ diam., 18–20μ long; epispore (in not quite ripe spores) smooth, translucent.

Distinguished from all the species described in Bornet & Flahault, Revision des Nost. Het., by the very slender trichomes; and from *C. limicola* Kirchner, Algenflora Schlesiens, p. 237, and *C. minutum*, Wood, F. W. Algæ of the U. S., by the cylindrical cells with joints not constricted. Its systematic position is next to *C. muscicola* Kuetz.

Found among other algæ in a scum in a ditch, Malden, Mass., Oct. 12, 1890.

NEW WESTERN RANUNCULACEÆ.

By Edward L. Greene.

Ranunculus eremogenes. Annual, erect, 1 to 2½ feet high, stout and fistulous, sparingly leafy, simple below, loosely corymbose-paniculate above, glabrous, the herbage light-green: leaves of rounded general outline, mostly 5-parted and the segments cleft into about 3 lobes, these toothed: flowers 4 or 5 lines broad; light yellow petals surpassing the sepals: head of numerous small achenes obtusely ovoid, the oblong-ovoid receptacle much inflated: achenes minute, thick, little compressed, nearly beakless.

Plant of wet springy places and margins of pools in the West American desert regions, from along the eastern base of the Colorado Rocky Mountains, through the Great Basin, and to southeastern Oregon and northwestern British America; the American counterpart of the Old World *R. sceleratus*, to which it has been erroneously referred, being the *R. sceleratus*, var. *multifidus* of Nuttall. But the more dissected foliage is only one of several good characters exhibited by this neglected species. Its comparatively leafless stem and light yellowish green herbage are in very marked contrast with the copious leafiness and the vivid green of *R. sceleratus*. Its flowers are thrice as large; its heads of achenes much shorter and thicker; while the achenes themselves are smooth in *R. eremogenes*, but distinctly rugulose in *R. sceleratus*; and the mode of branching is strikingly different in the two.

Though first detected by Nuttall on the plains of the Platte, the most luxuriant specimens seen by me are from the region of the muddy lakes that lie along the northwestern border of the Great Basin in northeastern California and adjacent Oregon. Smaller specimens, with leaves more finely divided, were collected beyond the British boundary, on Milk River Ridge, by Mr. Macoun, in 1895 (n. 10036). I have often observed it, and collected it myself along the Humboldt River in Nevada, and along the Platte in Colorado. All doubts about its validity as a species have vanished upon seeing the real *R. sceleratus* as naturalized in Maryland, etc.

R. eremogenes does not cross either the Sierra Nevada or the Cascades to the more immediate Pacific Coast, where in the vicinity of the seaports *R. sceleratus* may confidently be expected as an immigrant. This was indeed collected once, if I mistake not, at San Francisco, by Dr. Kellogg; but is not yet known as established there.

Ranunculus microlonchus. Perennial, the rather large cluster of fleshy-fibrous roots supporting a tuft of erect lanceolate leaves and a single slender tortuous, often partly reclining leafy and few-flowered stem: leaves all entire, acute at both ends, the radical 1 or 2 inches long, on slender petioles as long, narrowly lanceolate, nearly glabrous above, but rather densely appressed-pubescent beneath; cauline few, relatively somewhat broader, with short petioles or subsessile; flowers one or several, yellow, 4 lines broad; sepals spreading; petals 5 to 8, obovate, obtuse: achenes few, in a depressed-globose head, obliquely obovoid, slightly narrowed at base, tipped with a short stout blunt style, moderately compressed, marginless, smooth and glabrous.

Collected by the writer in northern Idaho, August, 1889; long withheld from publication in expectation of finding traces of it in collections made by others in that region; though it was detected by me in only a single locality. It is, of course, of the *Flammula* group. The specimens are only from three to six inches high, the stem not twice the length of the quite copious tuft of radical leaves, the plant on the whole remarkably pubescent for one of this group, only the rare *R. Lemmoni* surpassing it in this regard.

Thalictrum campestre. Stem solitary, slender, leafy, 10 to 18 inches high: herbage glabrous, glandless, neither aromatic nor heavy-scented: leaves small, firm in texture, cauline short-petiolate; leaflets ¼ to ½ inch broad, glaucous beneath, mostly with 3 rounded and emarginate lobes: panicle thyrsoidly contracted and small, many-flowered: sepals 4, round-ovate, obtuse, 3 to 5 nerved: filaments abruptly clavate under the anther; anthers mucronate, sparsely pilose with spreading or retrorse hairs: stigma subulate, from a somewhat sagittate base: achenes small, sessile, ovate-oblong, scarcely compressed, only 1½ lines long exclusive of the straight beak, the angles or ribs about 5, the alternate ones less prominent.

Common on low prairies near Carberry, Manitoba, where it was collected by the writer in 1890. Stem always solitary and erect, though lateral upon the crown of the root, and curving upwards underground. The incipient stem for the succeeding year was two inches long, and projected horizontally beneath the surface, at the time of gathering the fruiting specimens in early August.

OPEN LETTERS.

Phacelia Cooperae.

This very pretty Phacelia was sent by its discoverer, M Ellwood Cooper of Santa Barbara, to Dr. Gray, and by him named in her honor and reported upon in Proc. Am. Acad., XV., 49. Subsequently in the supplement to Vol. II., Part 1, of his Synoptical Flora, issued January 1, 1886, Dr. Gray on p. 418 reduced *P. Cooperae* as a synonym of *P. gymnoclada*, Torr., for the reason that " only a single specimen is known" which "may well be only a form of this [*P. gymnoclada*] perhaps not collected in that district."

Under date of June 26, 1896, M. L. Fernald of the Gray Herbarium writes, "Yours is the first material we have had since the type of *Phacelia Cooperae* and there can be no doubt that it is distinct from *P. gymnoclada*, Torr."

From this it would appear that *P. Cooperae* must have a limited range or surely others would have collected it since June 1, 1886. I first found a small specimen in Santa Barbara in 1895 and subsequently a moderate number of better specimens in the Ojai Valley, Ventura Co., Cal., although seeming somewhat rare. This season it was considerably more plentiful in the Ojai and apparently well established along most of the streams of that valley. It is confined usually to sandy bars along stream beds, blooming in May. It varies from four or five to fifteen inches in height, vigorous specimens much branched from the base and spreading, but "primary branches" not "decumbent" as in *P. gymnoclada.*

It is worthy of remark that I have but once seen it away from the near vicinity of streams and that was in a field, recently freed by *burning* from *Adenostoma fasciculatum*, perhaps two hundred yards from the San Antonio Arroyo. The persistence of seeds and their quick germination in such burned localities is always very surprising. No trace of *P. Cooperae* was found in the adjoining unburned tracts of Adenostoma though clear spaces were frequent, sufficient to give ample opportunity.

P. Cooperae seems to be well established in the Ojai Valley and probably extends through a limited portion of the Coast ranges perhaps from Point Conception to Ventura. If of wider range it is to be hoped other observers will report it.

It is one of the prettiest of the small-flowered Phacelias with its profusion of pink yellow-throated flowers and should be worthy of cultivation. Specimens were sent to the Academy of Sciences, San Francisco, in 1895 and again this season, as well as to the Gray Herbarium, Cambridge, Mass.—FRANK W. HUBBY, Cleveland, O., June 29, 1896

SHORT ARTICLES.

Solanum elæagnifolium, Cav., in California.—This plant has recently been sent for identification from Traver, Tulare Co., by Mr. H. Hurst, who says "it seems to have started from seed swept from a grain car at one of our warehouses here, where it is growing and spreading considerably." The State Survey Botany gives as its range of distribution Texas to Arizona, Mexico and extra-tropical South America and adds that it probably occurs in the southeastern part of California. The California Academy of Sciences possesses a specimen collected by D. Waitt, near Riverside, y, 1884.

J. Burtt Davy.

Distribution of the Coast Redwood:—The southernmost station for the Redwood seems to be in Salmon Creek Cañon, twelve or thirteen miles south of Pt. Gorda, where there are several trees. As is well known the Redwood belt reaches its greatest development north of the Bay of San Francisco, and is continuous as far northward as Del Norte county. The last important body of Redwood is in Del Norte county on Smith River, and on Rowdy Creek, a tributary of that river. The most northern redwood trees, however, are to be found in Curry Co., Oregon, on the Chetco River, about four miles from the coast and about eight miles north of the California state line. These trees form an isolated grove which is, with one exception, the only grove of *Sequoia sempervirens* in Oregon. The second grove is on the Winchuck River very near the California line.

MISCELLANEOUS NOTES AND NOTES.

Mr. M. A. Howe has recently resigned his position as Instructor in Cryptogamic Botany in the University of California, and expects to devote the next year to an elaboration of the western material of Hepaticae which he has gathered together during the last four years. He will be succeeded by Mr. W. J. V. Osterhout, of Brown University, who comes to California from Strasburger's laboratory where he has been for a year past. Mr. Osterhout will be given charge of the cytological and physiological work in the Department of Botany.

BULLETIN No. 28 of the Wyoming Experiment Station contains the "First Report on the Flora of Wyoming," by Aven Nelson, Professor of Botany in the University of Wyoming. This embodies the results of a study of the collections made by the author in the years 1894 and 1895, and is largely devoted to a list of the plants known to occur within the boundaries of the state. Three new species and nine new varieties are described. The new species are *Aquilegia Laramiensis*, *Potentilla pinnatisecta* and *Hymenopappus ligulaeflorus*. The list of species is prefaced by several pages of comments on the various "floras," the "plant zones" and similar topics. The list of trees includes twenty-eight species, some of which, however, are hardly more than shrubs. The author thinks that the power of the mountain plants to withstand freezing is due to the reduced atmospheric pressure at great elevations. Various species were noted in bloom with the temperature at 5° to 20° F.

THE POSITION of Instructor in Botany at the University of Missouri has been awarded to Mr. Charles Henry Thompson, a student under Prof. Trelease at the Missouri Botanical Garden. Mr. Thompson is a Californian, his home being near Bakersfield. He is the anthor of a paper on the "Ligulate Wolffias of the United States" in the Seventh Annual Report of the Missouri Botanical Garden. He is the first to have discovered the rare *Wolffia lingulata* in California.

WE ARE glad to learn that the government of New South Wales has given evidence of a progressive spirit in the creation of the post of Government Botanist, and that it has shown its appreciation of the valuable botanical work of Mr. J. H. Maiden, by making him the first incumbent of the office. Mr. Maiden is a fellow of the Linnean and of the Royal Geographical Societies of England, and has been for several years Curator of the Technological Museum of Sydney, N. S. W. He is well known on account of his important investigations into the natural resources of New South Wales, especially in connection with the economic value of its flora. We tender him our hearty congratulations on his appointment.—J. B. D.

BRODIÆA HOWELLI, VAR. LILACINA has been flowered in England and is figured in the *Gardeners' Chronicle* of June 20, p. 767, fig. 134. It is described as "one of the least known, and one of the prettiest" of Brodiæas. The flowers are lavender-blue, with white segments.

A BIOGRAPHICAL sketch, with portrait, of Dr. Benjamin Smith Barton appeared in the *Popular Science Monthly* for April.

PUGET SOUND UNIVERSITY owns some twelve hundred acres south-west of the city of Tacoma, of which two hundred acres are set aside for an arboretum of such trees as will flourish in the climate of that region. Already some 10,000 plants of 250 species, both native and foreign, form the nucleus of the collection which will be of both scientific and economic value.

FRITILLARIA PUDICA, Spreng., is figured in the *Gardeners' Chronicle* for March 28 (Ser. 3, xix., 403) from a plant grown by R. Wallace & Co., of Colchester, England, and exhibited at the Royal Horticultural Society's meeting on March 28, when it was awarded a First Class Certificate as a horticultural plant. The range of this species is given in the Botany of California as "in the mountains from Carson City to British Columbia and eastward to Montana and Utah."

A "PRELIMINARY Revision of the North American species of Echinocactus, Cereus and Opuntia," the result of some studies by Prof. J. M. Coulter, is published in the Contributions from the U. S. National Herbarium, Vol. 3, No. 7 (Apr. 1, 1896.)

DR. C. F. MILLSPAUGH AND L. W. NUTTALL are joint authors of a "Flora of West Virginia," published in January, 1896, as No. 2 of the Botanical Series of the Field Columbian Museum, Chicago. The catalogue of species includes the fungi, lichens, hepatics, mosses and ferns, as well as the flowering plants. There are illustrations from photographs of *Betula nigra* and of *Rhus radicans* which show well the characteristic growth of each of these species.

THE SECOND annual meeting of the Botanical Society of America will be held in Buffalo, N. Y., on Friday and Saturday, August 21 and 22, 1896. The Council will meet at 1:30 P. M. on Friday, and the Society will be called to order at 3 P. M. by the retiring president, Dr. William Trelease, Director of the Missouri Botanical Garden. The president-elect, Dr. Charles E. Bessey, Professor of Botany of the University of Nebraska, will then take the chair. The afternoon session will be devoted to business. At the evening session the retiring president will deliver a public address on "Botanical Opportunity." The sessions for the reading of papers will be held on Saturday at 10 A. M. and 2 P. M. The Botanical Society of America is affiliated with the American Association for the Advancement of Science, whose sessions this year begin on Monday, August 24, in Buffalo.

EISENIA ARBOREA Aresch.

By William Albert Setchell.

History.

In 1876, there appeared a paper in the *Botaniska Notiser*, entitled "De Tribus Laminarieis et de Stephanocystide osmundacea (Turn.) Trevis., observationes praecursorias offert T. E. Areschoug," which will ever be of the greatest interest to the students of the algæ of the Pacific Coast of North America. The author, Professor Areschoug of Upsala in Sweden, made known to the world two new and marvellous seaweeds and advanced the knowledge of two other, until that time either little known or even seriously misunderstood, species from the Californian coasts, which had been collected by his former student and Docent in the University, Dr. Gustav Eisen, then as now, of the California Academy of Sciences in San Francisco. The two new Algæ were *Eisenia arborea* and *Nereocystis gigantea*. The third member of the Laminariaceæ was *Egregia Menziesii*, for which a new genus was provided and which was removed from the Fucaceæ where it had been placed in the genus Phyllospora.

The final paper upon these species did not appear until 1884, when it was incorporated into the fifth part of Areschoug's "Observationes Phycologicæ." In this paper, is given a detailed account of the adult morphology of Eisenia, together with comparisons between it and some other Kelps, particularly with *Postelsia palmæformis* Rupr.

De Toni (Flora, 1891) and Kjellman (in Engler and Prantl, 1893), have mentioned it and De Toni again in the Sylloge Algarum (3; 359, 1895) has practically repeated Areschoug's description but has quoted "Vera Cruz, California," instead of "Santa Cruz," as Areschoug gave it.

The writer was the first as far as he knows, to point out the true relationships of the species, in his paper "On the Classification and Geographical Distribution of the Laminariaceæ" (Trans. Conn. Acad., 9; 348, 1893). In this paper were given also some hints concerning the probable development. Further information was given by the writer in his "Kelp Notes" in this journal for March of the current year. It is designed in the present paper to amplify and supplement these notes and present figures of the adult plant and of young plants of different ages, since no figures of this species have ever been published and specimens are all but unknown in herbaria.

Distribution.

Eisenia arborea is limited to the coast of California and flourishes best upon, or is perhaps even confined to, that part of the Californian coast lying to the south of Point Conception. Dr. Eisen's original specimens were collected at the Island of Santa Catalina, where the plant is found growing attached, but are credited by Areschoug to San Francisco. The importance of geographical distinction between the different parts of the coast of California, and the citation of very definite localities is becoming more and more necessary as our algæ are being studied more carefully, and it seems probable that we shall be able, when considerable more definite information has been accumulated to recognize definite northern or southern limits, as the case may be, for many of our species, limits having very definite relations with the position of the isotheral or isocrymal lines.

Eisenia arborea is abundant about San Diego where it has been collected by Mr. Daniel Cleveland and by Professor Carl Eigenmann. Professor Farlow has collected an abundance of fine large specimens at San Diego also. At San Pedro and Redondo, the writer collected plentiful material and a set has been prepared for distribution. Dr. Anderson informs me that he finds it occasionally floating in the Bay of Monterey, but always after severe winds from the south and in the form of more or less battered specimens.

Adult Morphology.

A. HOLDFAST.

The holdfast of *Eisenia arborea*, as is the case in most Algæ, varies very considerably according to the particular habitat of the specimen. It is usually composed of a considerable number of rather slender hapteres, several times dichotomously branched, the ultimate branchlets being very fine, numerous, and contorted. The diameter of the entire holdfast is generally considerable, reaching, or perhaps even exceeding 25 cm. The attachment is made to stones or angular projections from the larger rocks, and specimens often must needs be removed from the substrata by the aid of the knife. The specimen figured in Plate 4 shows a typical and very well-developed holdfast.

The hapteres themselves arise from the very base of the stipe in three or four fairly regular whorls. A cross section of a single haptere shows a rather irregular circle of mucilage ducts lying at some distance within the periphery. The ducts seem to be more abundant in that portion of the haptere situated away from the substratum than in that directly adjacent to it.

B. STIPE.

The stipe varies in length according to the age of the individual. Areschoug's largest specimen possessed a stipe 28 cm. in length. In the largest specimen seen by the writer, the stipe was about 60 cm. long. It is fairly stout and rigid and remains nearly erect when the plants are left partially bare by the fall of the tide and projects above the surface of the water bent more or less under the weight of the heavy mass of sporophylls at the top. The stipe approximates to terete at the very base but soon becomes somewhat compressed, and this increases until at the top it is very decidedly flattened.

The medullary portion is flattened, even at the very base, while above it soon becomes narrowly linear in cross section. The whole internal structure is very dense and there is a row of mucilage ducts situated in the outer cortex. This line of ducts is nearer the medulla at the middle of the sides of the flattened portions and nearer the periphery at the ends.

C. BRANCHES AND LIGULES.

At the top the stipe seems to divide into two stout branches which are separated from one another by a broad and rounded sinus. They sometimes reach a length of 30 cm. or even perhaps exceed it. They are much flattened but one edge is blunt, thicker, and somewhat rounded while the other is thinner and sharper. Furthermore, these branches are not plane but are turned in toward one another at the tip of the stipe forming at that point a short, shallow furrow on one side, while the other side is decidedly convex. As they leave the stipe, they are twisted still more, through half a turn at least, thus causing what is properly the inner (or upper) margin to lie outwards and the outer (or lower) margin to lie inwards or toward the median longitudinal axis of the plant. This feature is well shown in the specimen reproduced upon Plate 4.

In cross section, each branch is nearly spatulate, the broader, rounded end being the outer or lower edge. The medulla is of the same shape and is considerably within the periphery until the inner (or upper) margin is reached where it comes to the very surface, thus showing, as will be noticed below, that the inner margin has resulted from erosion. About half way between the medulla and the periphery is a row of mucilage ducts.

At the tip of each branch, is situated a small flattened portion, the small subreniform blade of Areschoug's description. The fact that both the branches and these small expanded portions really arise from the original blade will be shown later. We may distinguish them as *ligules*. Each ligule bears upon its margin a number of strap-shaped prolongations, the sporophylls.

D. SPOROPHYLLS.

The sporophylls vary greatly in number but are usually fairly numerous, 30 to 50 being borne upon each ligule. They are long (up to 75 cm.), narrow (up to 6 cm. wide), thin structures, narrowly attenuated at the base and blunt or abruptly truncate at the apex, where they suffer erosion. The younger ones are rounded at the apex before erosion begins. The margins are provided with coarse, sharp teeth and the surfaces are coarsely and longitudinally rugose much as in Macrocystis.

The older sporophylls at the true outer (or upper) portion of the margin of the ligule, are mere stubs, being eroded nearly to the base. The middle ones are longer but the true outer (or lower) ones become smaller and smaller, until at last they are mere protuberances from the margin. This shows that the sporophylls are true out-growths from the blade and proves also their Ecklonioid character. The sporophylls of many of the specimens collected by the writer at San Pedro and Redondo in December, 1895, were in fruit.

E. Sori.

The sori do not form extensive and uniform patches covering completely the sporophylls as they do in Alaria, but are small and oblong or irregularly elliptical in shape, a few centimeters long and proportionally narrow. As they continue to be produced, they become confluent into fairly large patches of irregular outline nearly covering the entire surface of the older sporophylls. The unilocular sporangia and the unicellular paraphyses are of the usual type found in the Laminariaceæ.

(To be concluded.)

DISTRIBUTION OF RHAMNUS IN NORTH AMERICA.—II.

By Edward L. Greene.

I must here at the outset correct a statement made in the preceding paper[1]; for I therein remarked that the Rocky Mountain region had no representative of true *Rhamnus*, save as *R. alnifolia* was found in the northern sections of this elevated area. An examination of the abundant and wonderfully mixed herbarium materials that are held under the name *R. Californica*, has disclosed the presence of a new *Rhamnus* of the typical group, which as far as known, belongs to the mountains of the southern part of Colorado. This is

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[1] Supra, p. 83.

3. R. Smithii, Greene, Pitt. iii. 17. Related to the eastern *R. lanceolata*, this is a most interesting shrub; and it is not improbable that future research may considerably widen its known range. The regions in which it should be further sought are those parts of New Mexico and Utah which are most nearly adjacent to Southern Colorado.

By far the greater proportion of our species belong to what must at the least be recognized as the subgenus *Frangula*. This group was formerly everywhere received in the rank of a genus. Linnæus, the father of unnatural and unbotanical botany combined it with *Rhamnus*; yet the ablest men among his contemporaries, such as Haller, Miller, Adanson, Necker and Mœnch reaffirmed for *Frangula* the status of a genus. And some fifty years ago, such men as Brongniart, Bennett and Asa Gray were champions of the same opinion. The author last named, in the middle of his career, and in that most carefully and critically done of all his works, the *Genera Illustrata*, says of *Frangula* that it "is surely distinct from *Rhamnus*," and concedes to it that rank. Perhaps it may have been the authoritative pronouncement of Mr. Bentham in 1862, which turned the tide again in favor of the Linnæan view, and led even Dr. Gray to recede from his earlier position, and to restore the *Frangula* species to the genus *Rhamnus* in the later editions of his *Manual*. When I say of Mr. Bentham's pronouncement that it was authoritative, I mean that it was arbitrary, and not based in reason. The two assumed reasons given by him are not reasons. When he says that the two groups are alike in habit and inflorescence he is in error as to the facts. The two types are so different in habit that field botanists everywhere recognize the difference; and most of those who have maintained the two genera have been men who were accustomed to lay stress upon habit as the mark of a genus. Neither is the inflorescence the same in both; for while in true *Rhamnus* the flowers are scattered singly or in pairs or threes up and down the twigs, in *Frangula* they are always in axillary and usually peduncled cymes or umbels. But since in the type-species of *Frangula* the umbels are often few-flowered and sessile, Mr. Bentham's error is one which, in a superficial and inexpert botanist might have been excused; though no man even casually examining a considerable series of species in each of the two groups, would find warrant for saying that the inflorescence in the two is the same. Mr. Bentham's other remark, that many species remain to be investigated as to the fruit characters, and that until these are better known, the constancy of those characters cannot be asserted —all that is a line of argument by following which it is probable that almost any two closely related genera of plants could be merged in one. It is purely negative and unconvincing. By the fruit and seed characters, as far as one knows them, *Frangula* differs from genuine *Rhamnus* more than it does from *Ceanothus;* and there is small room for doubt that the two groups are destined to gain recognition as generically distinct.

Of the *Frangula* group we seem to have only one clearly recognized species in eastern North America, namely,

4. R. CAROLINIANA, Walt. Carol. 101. This species, as received, and waiving all question about its being possibly an aggregate of several, enjoys the widest distribution of any American member of the genus. It is credited with occurring all along from New Jersey to Missouri, thence southwestward as far as the Rio Pecos in western Texas, and southward through all the Atlantic and Gulf states. At its extreme southwestern limit, not more than two or three hundred miles intervene between it and the eastern limit of one of the Pacific Coast Franguli, namely, that modification of the central Californian *R. tomentella* which pervades the less arid districts of middle Arizona, reaching even the borders of New Mexico. But this last, like *R. Californica*, is a persist-

ent-leaved species, while *R. Caroliniana* is thin-leaved and deciduous; and its nearest allies are shrubs from which it is geographically more widely sundered, namely, *R. betulæfolia* of a more remote section of New Mexico or Arizona, and *R. Purshiana* of Oregon and Washington; both these being deciduous.

By the records of the herbaria—such records as labels make when bearing wrong names—the species has even been attributed to a still more remote northeasterly range than is here accorded it; for the Long Island specimens under this name are plainly those of *R. Frangula*, the Old World species, now freely conceded to our northern flora, as naturalized from Europe. In many parts of the south the shrub is plentiful, though nowhere so at the northeast. In Louisiana and Mississippi it is abundant, and according to Father Langlois it is known to the French speaking inhabitants there as "Café sauvage," or wild coffee; an appellation formerly given to *R. tomentella* and *R. Californica*, at a time when it was pretended that their coffee-like pyrenes might become a fair substitute for coffee.

THE ALPINE FLORA OF MT. SHASTA.

By Alice Eastwood.

The geographical distribution of plants and animals has ever been attractive to naturalists and travelers; the wide diffusion of some genera and species, the singular isolation of others will always excite interest and inquiry. Now-a-days the subject is so connected with the geological history of the earth and the evolution of species that it is a duty to note the physical features of a country when studying its flora or fauna.

Throughout the west no two sections of country are more interesting to the botanist than the mountain summits and meadows above the limit of trees, and the vast treeless deserts towards the south. Dr. C. Hart Merriam in the Proceedings of the Biological Society of Washington (Vol. VII., p. 24) has discussed these two distinct regions under the names Boreal and Sonoran, the Arctic division of the Boreal region being above the limit of trees. This Arctic division and the Sonoran region, alike in the almost total absence of trees, are quite dissimilar in all other respects. The same genus is not often represented in both, and identical species have not yet been reported.

The Sonoran vegetation consists chiefly of low spiny shrubs and annual herbs. The shrubs are distributed, with very little variation, over an immense area of country embracing parts of Colorado, Utah, Nevada, New Mexico, Arizona, Texas and California. The comparatively few species of perennial herbs have a distribution almost as wide; the annuals, with species numerous and frequently localized, show a strong tendency to variation.

The flora of the lofty mountain peaks belongs seemingly to another world. Here, tall shrubs and annuals are scarce, giving place to perennial herbs and low prostrate shrubs, resembling herbs, that hold possession of the soil with a root surface that is remarkably large and out of all proportion to the part above ground. The plants have familiar names; every one knows what is meant when we speak of gentians, primroses, potentillas, saxifrages, anemones, buttercups, clovers, stone-crops, asters, erigerons, valerians, drabas, chickweeds, willows, sedges, rushes and grasses. In fact, the genera are widely spread throughout the Arctic zone in both hemispheres, and on all the lofty peaks of the northern hemisphere. In a list of eighty-five genera of the alpine zone in the Rocky Mountains only six are not generally represented throughout arctic-alpine regions, while in a list of one hundred and eighty-five species, one hundred and four are distributed through the northern portion of both hemispheres in high latitudes and at great altitudes.[1] The botanist of the Alps, of Greenland, of Norway, of Alaska and even of the distant mountains of Siberia would feel at home amid the flowers that bloom in July and August near the summit of Pike's Peak, Colorado.

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[1] Gray and Hooker, "The Vegetation of the Rocky Mountain Region and a Comparison with that of other Parts of the World," in Bull, U. S. Geol. and Geog. Surv. Terr. VI. 1.

As everyone knows, this is due to the similarity of conditions that prevailed over most of the northern hemisphere during the Glacial Epoch. When the fields of ice and snow retreated northward or moved southward, they carried seeds and roots of the plants, then inhabiting the earth, along with them; and wherever a chance offered, these plants made themselves at home and continued to flourish until the environment changed so as to become no longer adapted to their welfare, when they were pushed gradually upward to where the Arctic conditions prevailed. Even now in Greenland and Alaska where the slow melting of a glacier forms a marshy spot, or in the Rocky Mountains underneath a melting snow bank, where the snow never disappears entirely, conditions similar to those that prevailed along the route of a glacier can be seen. The seeds of these plants can withstand a great degree of cold without loss of vitality and the plants themselves continue to thrive and reproduce under hard conditions. They can freeze every night, gradually thaw after sunrise and keep on growing and blooming until the fruit is ripe.[1]

It was to learn about the alpine flora of Mt. Shasta that in August, 1893, I ascended that grand snow-capped mountain, rising more than 10,000 feet above the surrounding country, and more than 14,000 feet above the level of the sea. From the base, there is a belt of timber consisting chiefly of sugar pine, yellow pine, spruce and fir. In open spots the underbrush is dense, chiefly *Manzanita*, *Ceanothus* and *Castanopsis*. Under the conifers, plants of the *Ericaceæ* are most common; besides, there are several species of *Pentstemon* and *Lupinus*, the widely distributed *Gilia aggregata* and *Monardella odoratissima*, the peculiar *Nama Lobbii* and the beautiful *Cycladenia humilis*. *Lilium Washingtonianum* and *L. parvum* were seen on the way up, the former quite abundant in the areas of chapparal. Many other plants abound; but these are mentioned as the most conspicuous.

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[1] At Crested Butte, Colorado, one morning before sunrise, I found a meadow full of *Gentiana serrata*, Gunner. All were frozen stiff and when brought into the warm atmosphere of the house became mushy. About noon of the same day I went out again; not a gentian drooped its head, all were as beautiful and full of life as if they had never known a frosty night.

Above timber line, however, where I had expected to see wonderful flower gardens full of old favorites and rare species new to me, where flowers of every color, beautiful in form and luxuriant in abundance would make the earth so lovely that the remembrance would be a never failing delight, the appearance was bleak, barren and utterly disappointing. Instead of meadows full of flower-bordered rivulets there were huge cliffs of volcanic rock and immense fields and slopes of snow. Flowers were to be seen, but the species were few, the individuals not abundant, nor with one or two exceptions were they conspicuous.

The following were in bloom above timber line:

1. Bryanthus empetriformis Gray.
2. Polygonum Shastense Brewer.
3. Dicentra uniflora Kellogg.
4. Silene Grayi Watson.
5. Sibbaldia procumbens L. Reported by W. L. Jepson, August 4, 1894.
6. Hulsea nana Gray.
7. Castilleia pallida Kunth. var. occidentalis Gray.
8. Eriogonum pyrolæfolium Hook.
9. Viola præmorsa Dougl. (V. aurea Kell.)
10. Phlox Douglasii Hook.
11. Eriogonum marifolium T. & G.
12. Spraguea umbellata Torr.
13. Pentstemon Menziesii Hook.
14. Saxifraga Tolmiei Gray. Collected by J. G. Lemmon.
15. Saxifraga bryophora Gray. " " " "
16. Campanula scabrella Engl. " " " "
17. Gilia aggregata Spreng. Near timber line but not above it.

18. Lupinus ornatus Dougl.
19. Carex.

The first eight of the above list were found only above timber line and so constitute the true alpine flora of the mountain.

1. *Bryanthus empetriformis* Gray, belongs to an arctic genus represented in few species through Alaska, Greenland, Labrador, Northern Europe, eastern side of Behring Sea, the White Mountains and the Sierra Nevada Mountains.

2. *Polygonum Shastense* Brewer, is much more closely allied to *Polygonum Paronychia* Ch. & Schl. which flourishes along the coast from Santa Cruz to Vancouver Island than to the arctic species *P. Bistorta* L. and *P. viviparum* L. found generally throughout arctic-alpine regions.

3. *Dicentra uniflora* Kell. is the only member of this genus that braves the alpine cold. The genus *Dicentra* prefers cool, moist, shady situations. Besides the North American species, there are six in Western Asia and the Himalayas.

4. *Silene Grayi* Watson is quite unlike the low mossy *Silene acaulis* L. which so beautifully carpets alpine meadows and slopes in the Rocky Mountains. There are however several other arctic-alpine species; but this is more closely allied to Pacific Coast species than to those usually growing near perpetual snow.

5. *Sibbaldia procumbens* L. is a true arctic-alpine species, the only cosmopolitan reported from Mt. Shasta. It is found throughout Europe on all the high mountains; in the Arctic regions of both hemispheres; and in North America on all the high mountains as far south as the San Francisco Mountains in Arizona.

6. *Hulsea nana* Gray. The genus *Hulsea* is peculiar to the Sierra Nevada system of mountains and ranges from Washington to Lower California. It belongs to the *Bahia* group and has for its nearest relatives plants of undoubted Sonoran origin, such as *Chænactis*, *Florestina* and *Trichoptilium*.

7. *Castilleia pallida* Kunth var. *occidentalis* Gray differs

somewhat from the Colorado plant of the same name, but probably not sufficiently so to be of any moment. *Castilleia* is an American genus with the exception of one or two species in northern Asia. The genus is at home equally in maritime, alpine and Sonoran regions.

8. *Eriogonum pyrolæfolium* Hook. is a member of a genus especially noticeable throughout the Sonoran region. Outside of some genera of Compositæ, and perhaps Chenopodiaceæ, no genus is so well represented there in number of species and individuals.

The rest can hardly be considered truly alpine, as they are found also below the limit of trees; but even if they were to be included, they do not show closer boreal affinities than the first eight.

This comparison seems to show that the alpine flora of Mt. Shasta is more closely allied to Pacific Coast and Sonoran plants than to those from the north.

Why should this mountain, surpassing in altitude any of the peaks of the Rocky Mountains have only one cosmopolitan alpine plant? *Primula*, *Dryas*, *Gentiana*, *Potentilla*, *Polemonium*, the numerous representatives of Cruciferæ, Ranunculaceæ and (with one exception) Caryophyllaceæ are all wanting.

Above the tree limit there is not much chance for plants to grow; great stretches of snow and lofty cliffs of volcanic rock leave but little available soil. Water is scarce. From the base up to the snow fields there are only three places where water is obtainable. The little streams that trickle from the snow-banks in the Rocky Mountains and gradually unite into rivulets are totally lacking on Mt. Shasta. This is easily understood when the volcanic character of the mountain is considered. It is an immense lava cone. The snow that melts under the summer sun sinks down through the porous rock and issues at different strata in springs of enormous volume. Undoubtedly, the springs along the Sacramento River near Dunsmuir, Shasta Springs and thereabouts have the snows of Mt. Shasta as their source.[1] The water comes forth from the hillside with a rush and a volume that is unsurpassed. For miles along the Sacramento River, the hillsides are washed with the falling water as it flows forth, not in rivulets but in sheets.

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[1] Geol. Survey of Calif. Vol. I. p. 350.

However, the lack of running water and the dryness of the soil can hardly account for this flora showing so little affinity with what is expected on high mountains in the Northern Hemisphere. The explanation must be sought in the geological history of the mountain. Compared with the Rocky Mountains, the Cascade and the Sierra Nevada Mountains, to which Mt. Shasta belongs, are quite recent; nor do they extend to the Arctic regions, so the connection with the extreme north is not so close nor the relationship so intimate as in the Rocky Mountains. According to Asa Gray, the entire alpine flora of the Pacific Coast contains fewer species and a smaller proportion of arctic species than the Rocky Mountains, as shown by the following table:

Alpine species in the Rocky Mountains, 184; 56% Arctic.
Alpine species in the Pacific Coast Mountains, 111; 45% Arctic.

The volcanic nature of Mt. Shasta may have had something to do with cutting it off from glacial connection with the north. While nobody knows or even presumes to guess when the last eruption took place on Mt. Shasta, evidences of recent volcanic action are known in the same region. At Cinder Cove near Lassen's Peak volcanic action is thought to have ceased only two hundred years ago, and solfataras are quite common throughout the entire region, one on the top of Mt. Shasta seeming to indicate that the volcano is not yet entirely extinct. Its isolated position, too, may have had considerable influence in depriving it of species found on other high mountains of the Pacific Coast and giving it some local species; probably the dryness of the soil has prohibited many species and greatly restricted the number of individuals; but whatever is the reason the fact remains that on Mt. Shasta there is an almost total lack of those species that connect the Rocky Mountains with the Alps and unite the northern parts of Europe, Asia and America.

REVIEWS AND CRITICISMS.

Plant Breeding. By L. H. Bailey. MacMillan & Co., New York. 1895.

Professor Bailey's papers on "Cross Breeding and Hybridising" and similar subjects are so well known that to those familiar with his writings this volume hardly needs his signature. The book contains five lectures on the amelioration of domestic plants. The chapters which are of greatest interest to the botanist are those entitled Lectures I and III. In Lecture I the fact and philosophy of variation are considered and the causes of individual differences are discussed. The part which sex plays in variation, the influence on the plant of a decrease or increase in the food supply, the effects resulting from the gradual transfer of a species from the equator towards the pole, or from northern to southern latitudes, the relation of climate to plants, and most important of all, the struggle for life as a cause of variation, are some of the topics which receive analysis in this chapter.

The third chapter, which seems to us of especial value, describes the manner in which domestic varieties originate and explains the rules which must control in the production of new varieties other than those which are purely fortuitous.

The other chapters, however, will not be neglected by the reader. The book as a whole is a most charming resumé of what is now known concerning the evolution of the cultivated flora. The treatment is brief, but we are given a clear and logical statement of principles based upon observation and practice, with a sufficient array of illustration in the way of examples which are frequently quite familiar. Throughout, we are glad to observe, the sophistries and transcendental theories which so often attend discussions of heredity and variation are most happily absent.

It is easy to add that no one else in America is so well qualified to write a text-book with the above title. Professor Bailey, in addition to his philosophical qualifications, has practical knowledge of all that relates to the subject matter, and is in sympathetic relations with the leading horticulturists and growers and experimentalists. The problems with which this book is concerned are either part of, or touch so closely, the problems of greatest moment in modern botany that the book, while not written for botanists, will be found by them to be most readable and instructive.—W. L. J.

Essentials of Vegetable Pharmacognosy. Part I. The Gross Structure of Plants. By Henry H. Rusby, M. D. Part II. The Minute Structure of Plants. By Smith Ely Jeliffe, M. D. New York. D. D. Haynes & Co. 1895.

The text-books of botany designed for pharmaceutical students which have come under the writer's eye seem to have been constructed largely on the plan of no physiology, a modicum of gross morphology, and a varying amount of histology, which usually involves so much study of minute structure as will enable the student to recognize a second time some plant-part useful in the materia medica. All this is in a degree suggestive. Lack of interest in botanical science, as well as lack of knowledge, is common to so many pharmacists that among botanists it is a matter of comment. The text-books, if reflective of botanical teaching in institutes of pharmacy, obviously indicate the errors of method and the absence of inspiration.

The volume whose title heads our notice is certainly far superior to most of the medical botanies and similar texts that we have had opportunity to look into. Part I, which makes up the larger portion of the volume, is given up to the gross morphology of flowering plants. In this there is something of a physiological coloration which might well have been intensified for the purpose of attracting the student and holding his interest. However, we know of no similar textbook which treats of "protection of fruits" and "seed distribution," or goes so fully into such matters as pollination and fertilization.

The form of the book is not pleasing. The matter is disposed in double columns on a rather large page and presents an obviously antique appearance. The illustrations are numerous, but their value to the teacher and independent student is impaired because of imperfect explanation. In many cases no indication of the species from which the organ illustrated was derived is to be found in the text.

Part II is replete with errors.—W. L. J.

SHORT ARTICLES.

NEW LOCALITY-RECORDS FOR THE BAY REGION.—*Nicotiana Bigelovii*, S. Wats., is plentiful in sandy places along the banks of Russian River from Duncan's Mills to Guerneville, Sonoma Co., and a correspondent tells me that it occurs as far up the river as Healdsburg.

Glycyrrhiza glutinosa, Nutt., near Russian River Station on the N. P. C. R. R., Sonoma Co., July 22, 1896.

Mentha Pulegium, L., is exceedingly abundant about Russian River Station, and on both sides of the river at Guerneville. On some of the alluvial "bottom-lands" near the mouths of creeks it occurs in such masses as to color large areas when in blossom. J. BURTT DAVY,

GERANIUM PARVIFLORUM, Willd.—A specimen in the Herbarium of the California Academy, collected by J. W. Congdon on the slopes of Mt. Tamalpais, Marin Co., has been identified by Dr. Trelease as this species. It grows near Olema also, but seems to be rare. It has not previously been reported from California. ALICE EASTWOOD.

SCOLYMUS HISPANICUS, L.—Miss E. Cannon found this plant growing in abundance at Los Gatos, Calif., in 1893, and has this year collected good specimens in the same locality. Mr. Greenman, of the Gray Herbarium, reports that it was collected as a ballast weed at Gerard Point, Philadelphia, Pa., Aug. 26, 1877, by a Mr. Parker. This appears to be the first record of its occurrence, spontaneously, in the United States. ALICE EASTWOOD.

MISCELLANEOUS NOTES AND NEWS.

MR. C. P. NOTT of Brown University has been appointed Assistant in Botany in the University of California.

THE *Botanical Gazette*, now the property of the University of Chicago, will be published in 1896 and thereafter in two yearly volumes. The June number closes Vol. XXI. The editorial control remains unchanged except that a number of associate editors are to be added. Those for America are Prof. G. F. Atkinson of Cornell University, Prof. V. M. Spalding of Michigan University, Prof. Roland Thaxter of Harvard University and Dr. William Trelease of the Missouri Botanical Garden.

THE EDITOR of the *Journal of Botany* chronicles in the June number the decease of ERYTHEA. The infallible Mr. Britten has hitherto been pressed to confusion by his hazardous remarks concerning ERYTHEA and those who control its fate, hence it might seem that before a second venture a casual glance at the list of recent literature in the *Botanisches Centrall-Blatt* or the *Torrey Bulletin* would have been made to secure possible negative evidence in the absence of positive information. The news column in the *Journal* is often very entertaining on account of the frequency with which the editor visits the lash upon an unlucky countryman for irregularity of publication or some bibliographic sin caused by failure to look up, or interpret aright, an accessible reference. Nevertheless we may hereafter be excused for cherishing doubts as to the reliability of the information which Mr. Britten diffuses.

MR. WILLIS L. JEPSON, through the courtesy of the Regents of the University of California, has left for the east, to spend the fall and early winter months of this year in Cambridge, Mass., at the Gray Herbarium.

NOTES ON THE POLLINATION OF SOME CALIFORNIAN MOUNTAIN FLOWERS.—II.

By Alice J. Merritt.

Continued from p. 103.

Streptanthus campestris, Wats., grows sparingly about a very moist meadow. Honey is fairly abundant. The four large stamens are slightly exserted. All of the anthers dehisce slowly, beginning at the tip, and recurve so that the pollen-covered surface is upward. On account of this recurving the stigma does not seem likely to be self-pollinated, although it is below the exserted anthers. During the few moments I watched the plants I saw the flower visited by Bombus Californicus.

Thelypodium stenopetalum, Wats., is generally common in the San Bernardino Mountains, but was rare in the vicinity of the lake. The greenish yellow flowers are not conspicuous, but the clusters are of long duration and the honey is so abundant that in passing the flowers along the stage route one notes that the plants are fairly humming with bees of different sorts.

Viola chrysantha, Hook., must have been very abundant earlier in the season, and there was still an occasional flower in July. I was fortunate enough to see a native bee, an Anthophora I think, visit the flowers, behaving precisely as do the hive bees in visiting *Viola pedunculata*. The bee alights on the lower petal, but seems unable to reach the honey from this position and so shifts rapidly to the upper petal. Indeed the flowers of these two species are very similar in structure and color, having the same purple lines as honey guides, and the bees must effect cross-pollination for both species. The mountain species was in abundant fruit.

Silene Parishii, Wats. This plant grows in many-flowered tufts. The structure of the flower with reference to pollination much resembles that of *S. laciniata*, entrance to nectar being guarded for some time by dehiscing anthers, later by matured stigmas, and the long tubular calyx excluding many guests. Like *S. laciniata* this species could be cross-pollinated by humming-birds, but its flowers are inconspicuous by daylight and I have seen the birds visit other flowers in their vicinity and quite miss these. The pale yellow color and marked odor of the flowers suggest night pollination. I found the honey very abundant in the afternoon, but had no opportunity to observe them at night.

Sidalcea malvæflora, Gray, and *Sidalcea pedata*, Gray. *S. malvæflora* is rather common in the cienegas, but the scattered plants are inconspicuous, the perfect flowers being from 8 to 10 lines in diameter. *S. pedata* is less common but grows much larger, often four feet high, with its perfect flowers 1¼ to 1⅜ inches in diameter. Many plants of both species have only pistillate flowers, the stamineal column bearing anthers with empty cells or no anthers at all. These pistillate flowers are usually a little more than half the size of the perfect flowers of the same species. In a very wet meadow, along a little stream, I found a dozen plants of *S pedata* with pistillate flowers, while a parallel line of plants a few yards away had all perfect flowers. In the perfect flowers of both species the stigmas mature later than the anthers and stand, when they unfold, about two lines above the anthers, so that self-pollination seems impossible. I have never seen honey abundant except once in flowers kept in a vasculum over night. In *S. pedata* the honey is somewhat protected by hairs on the claws of the petals. I have seen *S. malvæflora* occasionally visited by hive bees, Anthophoras, and Bombus Californicus, but have seen only Bombus Californicus on the pistillate flowers of the other species. But one usually finds pollen grains on the stigmas of all the flowers and they fruit abundantly.

Hypericum Scouleri, Coulter, is common in moist places and grows in very showy masses. The three stigmas are held rigidly above the many anthers. The flowers have no honey, but are much frequented by bees and other insects for pollen. Any large insect is almost certain to effect cross-pollination by striking the stigmas first with the under side of its body thoroughly dusted with pollen. I have taken hive bees, wasps, and Melissodes on the flowers.

Hypericum anagalloides, C. & S., has inconspicuous flowers with anthers in contact with the stigmas. I have seen no insects visit them.

Geranium Richardsonii, F. & M., is abundant in July. The plants generally grow in masses and each plant furnishes a goodly show of flowers. The entire plant has a characteristic odor and the flowers are decidedly fragrant. The pale rose-colored petals have crimson lines as honey guides. The honey is abundant and is protected by hairs on the claws of the petal, but is accessible to almost any insect. The five higher anthers begin dehiscence as the flower expands, the others dehisce soon after, and all of the anthers during dehiscence are held two or three lines from the center of the flower by the spreading filaments, the faces somewhat downward. After dehiscence the anthers fall off, usually before the filaments resume a vertical position. The styles do not usually unfold until the anthers are fallen; their upper faces are stigmatic, but they recurve sufficiently to admit of pollination from below. As the lowest anthers are four lines above the corolla and the style-tips five or six lines from it small insects can easily rifle the flowers of honey without touching the essential organs. Indeed the most frequent guests are small bees, Megachiles and a Prosopis, and they are invariably useless. But larger bees, hive bees, Anthophoras, Osinia, Coelioxys and Bombus Californicus also frequent the flowers and are effective agents in fertilization since they nearly always cling to the anthers or styles. Large flies, although they usually rest on the corolla, are likely to strike the essential organs on entering. The plants have abundant fruit.

LICHENS OF THE VICINITY OF LOS ANGELES.—IV.

By Dr. H. E. Hasse.

Acolium Bolanderi, Tuckerm. On rocks. (In relation to *Acolium Bolanderi*, Tuckerm., Dr. Stizenberger wrote Sept. 27, 1894;—"a true *Acolium Bolanderi*, but here Tuckermann committed a gross mistake as did before him Koerber and Hepp (likewise Fée the elder) with similar structures. They looked upon parasitic Hyphomycetes as Caliciaceae. We have here before us a rust-fungus on the thallus of *Rinodina angelica*, Stiz. ! !"—and again on Dec. 2, 1894;—"*Acolium Bolanderi*, Tuckerm., is a Uredo-like fungus and not a lichen.")

Verrucaria punctiformis, Ach. On *Heteromeles*. Frequent.

V. papillosa (Ach.) Koerb., var. *terrestris*, Arnold. On earth; with minute black apothecia.

The following species were kindly determined for me by Professor Farlow of Harvard University.

Roccella leucophæa Tuck. Bluffs near San Pedro, growing abundantly upon *Lycium Californicum.*

Roccella leucophæa Tuck., *var. minor*, Tuck. Rocks exposed to ocean spray, Catalina Island.

Ramalina homalea, Ach. Rocks at Point Dumas, Santa Monica Range.

Parmelia Bahiana, Nyl. On *Quercus*, San Antonio Cañon, San Bernardino Range. "Identical with the Chilian plant" (Dr. Stizenberger.)

Lecanora melanospis (Wahl.) Ach. Rustic Cañon, Santa Monica Range.

Lecanora calcarea (L.) Somerf. Santa Monica Range.

Pertusaria Wulfenii, D. C. On trunks, San Bernardino Range.

Cladonia fimbriata (L.) Fr. On the ground, Santa Monica Range.

Biatora turgidula (Fr.) Nyl. Santa Monica Range.

Biatora varians, Ach. Santa Monica Range, common.

Biatora globifera (Ach.) Fr. Cañon del Sostine, Santa Monica Range.

Lecidea morio Schaer. Argillaceous rock, Santa Monica Range.

Lecidea enteroleuca, Fr. var. *ambigua*, Anz. Santa Monica Range.

Opegrapha rimalis, Ach. Near San Pedro, on bushes.

Arthonia premnea (Ach.) Tuck. Dead twigs, Santa Monica Range.

SHORT ARTICLES.

EPILOBIUM SPICATUM IN THE BAY REGION:—This plant has not been recorded as occurring within the limits of the Bay Region. The following localities are to be noted: Point Arena, Sonoma Co., July 5, 1892, *F. T. Bioletti*; near Russian River Station, Sonoma Co., on the North Pacific Coast Railroad, July 24, 1896, *Miss Alice Bolton*. Both specimens are in the herbarium of the University of California.

J. BURTT DAVY.

NEW STATIONS FOR TWO PLANTS.—*Geranium molle*, L., was recently collected near Olema, Marin Co., by the writer. *Linaria vulgaris*, Mill., was collected at Berkeley, 1893, by Mr. J. Burtt Davy. There is a small patch of it now growing near Point Reyes station, along the railroad track between Point Reyes and the ocean. An unidentified specimen in the Herbarium of the California Academy, collected at Valley Ford, Sonoma Co., by Mrs. Brandegee in 1886, is undoubtedly this species. ALICE EASTWOOD.

NOTE ON RUBUS LEUCODERMIS:—*Rubus leucodermis*, Dougl. is very abundant among the redwoods along Russian River between Guerneville and Duncan's Mills. I collected it in ripe fruit between July 21 and August 2, this year, and found that the fruits are bright red in color, turning blackish on ripening, with a marked flavor of the raspberry and some of the acidity of the blackberry; it is known as the "black-cap." *Rubus vitifolius* grows with it. J. BURTT DAVY.

NEW LOCALITY-RECORDS FOR THE BAY REGION:—*Datura Tatula*, Linn. Sandy river-deposits near Russian River Station and Guerneville, Sonoma Co., collected July 21, 1896, by the writer; also at Carmel Mission, Monterey, outside the *Manual* limits, August, 1896, *Willis L. Jepson.*

Mr. James Watson of Guerneville reports that a small grove of *Pinus Lambertiana*, the Great Sugar Pine, occurs near the head of Austin creek, Sonoma Co.

J. BURTT DAVY.

MISCELLANEOUS NOTES AND NEWS.

MONS. E. ROZE has been experimenting upon the expansion of the blossoms of *Œnothera suaveolens*, with the object of discovering the causes producing and effects resulting from the well-known sudden expansion of the corolla and reflection of the sepals. M. Roze concludes that the cause of the sudden expansion of the buds is due to moisture, either liquid or in the form of vapor, operating in the evening with a force proportionate to the amount of heat to which the plant was exposed during the preceding day. The results of his investigations are published in the *Bulletin de la Societe Botanique de France.*

DR. N. L. BRITTON has been appointed Director of the newly founded New York Botanical Garden which has been endowed with $250,000 by a number of wealthy New York gentlemen and others. The endowment having been secured, the city of New York has set aside 250 acres of land in Bronx Park for the Garden and is under agreement to contribute $500,000 for the erection of buildings for Herbarium, Museum and other purposes. The officers for 1896 are:

Cornelius Vanderbilt, President; Andrew Carnegie, Vice-President; J. Pierpont Morgan, Treasurer; N. L. Britton, Secretary. Prof. L. M. Underwood of the Alabama Polytechnic Institute will succeed Dr. Britton as Professor of Botany in Columbia University. The Herbarium and Botanical Library of the University are to be deposited at the Garden.

THE APPLICATION of color-photography to plant portraiture has recently been attempted with promising success by the horticultural journal *Le Jardin* which published in its issue for May 5 a photographic illustration in colors of *Cypripedium callosum.*

MR. W. R. SHAW, of Stanford University, has recently (Bot. Gaz., June, 1894) given us an account of his study of the sexual phase in the Coast Redwood, *Sequoia sempervirens.* The most important facts brought out are that the pollen-tubes do not penetrate the sporangium immediately in the neighborhood of the micropyle but in the upper fourth of the sporangium (which suggests a resemblance to chalazogamic types) and that the upper fourth or fifth of the embryo-sac becomes attenuated into a suspensor-like organ. As a general result of his work on the sporangia and prothallia the author confirms the opinion that the Taxodineæ are a most primitive group of modern Coniferæ. Mr. Shaw has not yet completed his investigation of the development of the archegonia.

THE MOST recent issues of Mr. C. G. Lloyd's Photogravures of American Fungi are Nos. 9 and 10, which represent *Polyporus Berkeleyi.*

PROF. J. D. WHITNEY, Sturgis-Hooper Professor of Geology in Harvard University, died Aug. 19, 1896, in New Hampshire. Professor Whitney was the chief of the California Geological Survey from 1860, until the survey was discontinued. Mt. Whitney, the highest peak in the United States, was named in his honor.

WE LEARN through a private letter recently received from Washington, D. C., that the Herbarium of the Department of Agriculture, known as the "United States National Herbarium," has been given into the possession of the Smithsonian Institution. Messrs. Rose and Pollard and Miss Vasey have been officially transferred with the Herbarium. We judge that Mr. Rose, who has been for a long time connected with the Herbarium, will be placed in charge of it under the new order of things.

THE HONORARY degree of A. M. was conferred upon John Muir, the Californian mountaineer, by Harvard University, at the June commencement exercises.

THE FOLLOWING new or noteworthy Cacti introduced into European cultivation from Lower California are mentioned in the *Bulletin du Musee d'Histoire Naturelle*, n. 8:—*Cereus Cumengii*, *C. Digneti*, *Echinocactus Peninsulæ* (a plant 7 to 8 feet in height), *Opuntia Alcahes* and *O. Cholla*, the latter being also met with in Southern California. Fuller details are given in the *Journal de la Societe Nationale d'Horticulture de France* for February, p. 226.

PROFESSOR C. S. SARGENT, of the Arnold Arboretum, Prof. W. H. Brewer, of Yale, Arnold Hague, of the United States Geological Survey, and Gifford Pinchot, of New York, members of the National Forestry Commission recently appointed under the auspices of the National Academy of Sciences, according to Act of Congress, have been for some time upon the Pacific Coast, investigating the condition of the government forest lands, with the excellent purpose of taking active means to prevent the reckless devastation of our fast diminishing forest areas. The board commenced its western tour of inspection at the beginning of July, the itinerary including North Dakota, South Dakota, Montana, Idaho, Washington, Oregon, California, Arizona, Nevada and Colorado. We heartily commend the work thus inaugurated and trust that it will be thoroughly and perseveringly pursued. The matter of forest conservation has been taken in hand none too soon.—J. B. D.

EISENIA ARBOREA Aresch.

By William Albert Setchell.

(Concluded from page 133.)

Development.

A. Earliest Stages.

The writer was very fortunate in obtaining a number of young fronds representing a considerable variety of stages of development, growing just below low water mark, at Dead Man's Island, which lies at the entrance to San Pedro Harbor, during Christmas week of 1895–96. None of the specimens, however, were young enough to show any trace of a one-layered primitive blade such as certainly exists in all the Laminariaceæ whose early stages of development have been investigated.

The smallest plant collected is about 6 cm. high. It has a short stipe of about 4 mm. in length, one or two very short hapteres, and an ovate-lanceolate blade whose widest portion measures about 2.4 centimeters.

The short stipe is cylindrical and the lower margins of the blade are absolutely smooth, while the apex is decidedly eroded (cf. Pl. V, fig. 1). These plants, together with several others ranging up to about 11 cm. in length, present the same appearance as young plants of species of *Laminaria saccharina* or more nearly perhaps those of the digitate section of the same genus. The blades of the largest of these specimens, however, begin to show a few coarse transverse wrinkles.

B. First Appearance of Pinnules.

A specimen measuring about 13 cm. in length shows one or two tooth-like projections upon the lower margins of the blade near its confluence with the stipe (cf. Pl. V, fig. 2). In slightly older specimens several of these teeth are present upon the basal margins of the leaf on both sides of the stipe and as the specimens increase in size and age, these outgrowths from the base of the blade become even larger and more prominent, until finally such a stage as the one represented in figure 3 of Plate V, is reached.

C. DEVELOPMENT OF PINNULES OR SPOROPHYLLS.

In the older stages of the young plants, we find that the outgrowths at the base of the frond become even more and more numerous and larger and larger as they recede from the transition-place until finally we have well-developed pinnules as represented in figure 4 of Plate V. The main portion of the blade is the prominent feature of this form, but the pinnules are conspicuous and show distinctly that they belong to the blade rather than to the stipe. They may be traced through the different stages from the larger flattened ones above, to those just appearing as outgrowths at the point of union of the stipe and blade (" transition-place").

As the older portions of the blade wear away above, the developing pinnules grow to be larger and larger, until finally such a form as that represented in figure 5 of Plate V is produced, where the mature pinnules are each of them fully as large as, or even larger than, the blade itself.

It is in such a stage as the one just described that the special characteristics of the genus Eisenia begin to be developed. We notice that the lower margins of the blade begin to turn in towards one surface.

D. DEVELOPMENT OF THE ARMS.

Up to the time when the lowermost margins of the blade begin to become involute, the base of the blade and the transition-place have presented perfectly plane surfaces and have resembled very closely young plants of Ecklonia. This resemblance is very striking and does not disappear until the turning in of the margins begins to be decidedly pronounced. Nothing of the sort occurs, as far as the writer knows, in any species of Ecklonia. Certainly there is no trace of it even in fairly large specimens of Australian *Ecklonia radiata* in the writer's possession. The scarcity of material, however, and the absence of direct statements upon this point allow us to consider, for the present at any rate, that at this point the departure of the *Eisenia*-type from the *Ecklonia*-type begins to be indicated. As the growth proceeds, the involutions become more and more pronounced and are accompanied by a thickening of the margins along the inrolled edges. Consequently, one surface of the blade becomes somewhat rounded and convex at this point, while the other becomes indented with a broad and rather shallow longitudinal furrow. This gives to the blade a certain dorsi-ventral character, *i. e.*, gives to the two faces different characteristics. A similar modification occurs in species of Agarum, and also in Arthrothamnus-species, where it is produced by two scroll-like involutions at the base. Another marked and important change is introduced at this time and that is connected with the place of origin of the pinnules.

The pinnules appear in the young plants at the transition-place and continue to be produced there until the basal margins of the blade begin to become involute. Then the formation of the pinnules is carried up, *i. e.* the new outgrowths occur at the tip of each scroll-like fold formed in each involution and as this increases in length (as it continues to do) the place where the new pinnules appear is removed farther and farther from the transition-place.

In Alaria, Pterygophora and Ecklonia, the outgrowth of sporophylls takes place at the transition-place where also the principal increase in length both of the stipe and of the blade takes place. But by the process just mentioned, the meristematic region in Eisenia becomes elongated and soon separated into two definite regions, an upper and a lower one.

The lower meristematic region seems certainly to persist, for the stipe continues to increase in length as well as in thickness, even to a very marked degree.

The upper portion of the meristematic region divides again, but this time longitudinally and soon becomes confined to two small regions, one at the apex of each thickened involute portion.

This is shown by the fact that the main flattened portion of the blade no longer increases in length to any considerable extent, but, by the constantly occurring erosion, becomes shorter and shorter until at last it is worn away, down to the very base, *i. e.*, down to the transition-place itself, leaving, however, the thickened involute margins with the small portion of meristematic tissue at the tip of each, projecting like two small arms, one on each side.

The gradual shortening of the blade at this period in the life history of the plant is very noticeable in the series of specimens obtained by the writer at San Pedro, in which the different stages of the process are very fully represented. In the final stage of the process, where the main portion of the blade has practically disappeared, the thickened basal margins project from the summit of the stipe from 3 to 6 centimeters.

A somewhat similar phenomenon, attending the shortening of the blade, takes place in adult plants of the species of Ecklonia. In these the blade proper sometimes becomes very short as compared with the length of the pinnules, thus producing a frond very broad in proportion to its length. This is very noticeable in *Ecklonia bicyclis* Kjellm., *E. buccinalis* (L.) Hornem., and to some extent also in *E. radiata* (Turn.) J. Ag., but as far as the writer can learn, the process of erosion in all these species stops far short of the transition-place, and a considerable part of the central portion of the blade remains. Although the base of the blade of Ecklonia does not seem to be thickened anywhere upon the margins, yet, in the erosion of the blade, the margins with the pinnules arising from them do not erode as readily as the central portion and are left behind, so that two flaps with pinnules attached are often left extending up from the margins at the top of the blade. These, however, are not at all thickened and do not appear in any way to be homologous with the arms of Eisenia. They simply show that the tissue of the blade which is directly connnected with the sporophylls or pinnules, even when adult, has greater vitality than the undifferentiated central portion. It is very much the same in Eisenia, only in this case, the tissue is exclusively basal and even more vigorous; the differentiation also, is carried further, and the two arms are the result.

After the erosion of the blade has been completed the plant has all the essential characters of the adult. The stipe increases in length through the activity of the meristematic layer at the transition-place, and in thickness by secondary processes within itself. The arms in turn increase in length by the activity of the meristematic layer at the tip of each. They increase in thickness, through secondary growth, until they rival the stipe itself in this respect and certainly come to look more like derivatives of the stipe than like derivatives of the blade. The sporophylls (or pinnules as the earlier sterile ones were called) arise continuously at the lower edge of the ligules, and wearing away, the older ones are lost, together with the upper edges of the same structures, as has been described above.

Abnormal Branches.

One very interesting case of branching was observed by the writer in a specimen cast ashore upon the beach at San Pedro. It was a fairly large plant, somewhat battered, yet showing very plainly that one of the arms had been lost. The other arm however after reaching a considerable length had divided again and produced two arms in turn, equal in every respect, and each bearing a ligule with its bunch of sporophylls at the tip. These two secondary arms were in every way like the two produced normally in the species.

General Considerations.

The general course of the development in Eisenia follows that already known in several other Laminariaceæ in which the ontogeny repeats, or appears to repeat, to a certain extent the phylogeny of the form. The earliest stages described consist of a simple stipe, holdfast, and unmodified blade and resemble very closely the simpler Laminariæ. Then the pinnules begin to appear and gradually give the frond the appearance of an Ecklonia. Finally the especial characteristics of the genus develop by the thickening of the bases of the blade, the splitting and separation of the meristematic regions, and the various accompanying secondary changes which lead to the production of the arms and the ligules with their sporophylls.

The most interesting thing in the morphology and development of Eisenia is without question the branching. It is the only member of the Ecklonieæ as far as is known, which branches, and the branches in origin, and portion of the plant concerned, can hardly be homologized with any of the normal branches of other members of the Laminariaceæ. The species of only one other genus of the Alariideæ (or Laminariaceæ with sporophylls arising as outgrowths from the frond) possess branches, viz. Egregia, and the branches in the species of that genus arise in quite another fashion. The nearest approach to the method of branching in Eisenia is to be found in the Lessoniideæ and in the subtribe Lessonieæ. The branching here is dichotomous and arises at the transition-place where the meristematic tissue is completely separated into two longitudinal halves. But the behavior of the meristematic tissue, from which growth in length proceeds, appears to be even more complex in Eisenia than in any of the Lessonioid genera, because in Eisenia there occurs, apparently, first a transverse splitting in which the portion belonging to the stipe is separated from that belonging to the blade. This kind of differentiation or separation occurs in no other member of the Laminariaceæ as far as the writer knows. It is the rule in all the other branching, as well as the unbranching, forms, that stipe and blade possess a common meristem at the transition-place. New meristems may arise, as in Egregia and in Thalassiophyllum, giving rise to branches of the stipe and new blades, but in every case each meristem adds to stipe upon the one side and to blade upon the other.

The second splitting, which must occur simultaneously with, or very soon after the first, separates the meristem of the blade longitudinally into two portions as has been shown above.

The peculiarities of the genus arise, then, from the separation of the primary meristem into three parts one belonging to the stipe and two belonging to the blade. Consequently, the arms and ligules are blade rather than stipe structures.

That the blade meristems may, under certain circumstances, divide again, is shown by the case of abnormal branching described above. Unfortunately the specimen was too far advanced to show exactly how this division of the ligule meristem arose.

Relationships.

Areschoug, as noted above, seemed to consider *Postelsia palmæformis* Rupr. as most nearly related to Eisenia in general appearance, although he mentions especially that the leaves (sporophylls) do not arise by splitting, thus recognizing what the writer considers a fundamental difference between Eisenia and all the Lessonioid genera. The origin of the sporophylls as outgrowths, places the genus among the Alariideæ, which the writer established to contain genera (*Alaria*, *Pterygophora*, *Egregia*, *Ecklonia*, *Eisenia*, and *Ulopteryx* or *Undaria*) more closely related phylogenetically one to the other than to any of the other members of the Laminariaceæ. The fact that the sporophylls originate upon the blade side of the transition-place meristem and, when this is divided transversely, are carried up by the progress of the blade meristem, demonstrates that the genus is more nearly related to Ecklonia than to Alaria or Pterygophora. The differences existing between it and Ecklonia have already been considered and seem to the writer to be sufficient reason for considering it to be the highest development of what may be called the Ecklonioid type.

EXPLANATION OF THE PLATES.

Plate IV. Adult plant of *Eisenia arborea* Aresch., from a photograph. 1-25 nat. size.

Plate V. Fig. 1. Youngest specimen obtained at San Pedro, showing the *Laminarioid* stage of the blade.

Fig. 2. Showing the first appearance of the pinnules at the base.

Figs. 3 and 4. Showing the pinnules in more advanced stages.

Fig. 5. Showing full development of the pinnules in connection with the blade, which is beginning to become involute at the lower margins.

All the figures of Plate V are from photographs ½ nat. size.

THE ANTHERIDIA OF CHAMPIA PARVULA.

By CHARLES PALMER NOTT.

Although *Champia parvula* is an old and familiar species, of which the cystocarpic and tetrasporic forms have been exhaustively studied by various well-known algologists, yet until recently antheridial plants have been entirely unknown. While collecting at Butler's Point, Wood's Holl, Mass., in August, 1895, the writer found, amongst a quantity of cystocarpic and tetrasporic plants, a single good antheridial specimen. Very careful search on several occasions in the localities where *Champia* was abundantly growing resulted in the discovery of about fifteen good specimens of antheridial plants, upon which the following observations are based.

An examination of the literature relating to the genus *Champia* shows that the male plant has never been fully described. The important systematic works such as Agardh (1)[1] Farlow (2) and Hauck (3) do not refer to it, while those writers who have made detailed studies of the morphology of the genus do not mention it in any way whatsoever. Debray (4) in his papers upon the structure and development of *Chylocladia, Champia* and *Lomentaria*, considers only the vegetative structure, the cystocarps, and the tetraspores. Hauptfleisch (6) in an exhaustive paper upon the fruiting organs of *Chylocladia, Champia*, and *Lomentaria*, likewise does not include the antheridia. Buffham (7) in a paper devoted mainly to the antheridia of certain *Florideae*, has described and figured the antheridial forms of about twenty genera and species, but he does not refer to *Champia* in his discussion. Webber (5) in a note upon the antheridia of *Lomentaria uncinata*, says that they form little spherical heads upon the tips of the branches of the frond. A section through a head shows it to be a tuft of radiating filaments, of two to four cells each, originating from the terminal cells of the branch, and bearing at their extremities the antheridial mother-cells. He also states that one of these antheridial plants likewise bore numerous tetraspores.

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[1] The numbers refer to the numbered titles in the bibliographical list on p. 167.

Observations made in 1895 by the writer upon plants of *Lomentaria uncinata* gave the following results. A number of detached plants were first examined thoroughly in order to make sure that no organs resembling those described by Webber were present. These were placed for a time in a dish of quiet water, when it was found that they attached themselves to the sides of the dish by the tips of the branches of the frond. These plants, upon being carefully removed and sectioned, showed that there had been developed upon the tips small disks composed of several layers of radiating cells, the outermost of which were colorless and densely filled with highly refractive granules of protoplasm, so that they might readily have been mistaken for antheridia. The writer is therefore of the opinion that although the structures described by Webber bear a strong resemblance to antheridia, they are in reality secondary holdfasts developed upon the tips of the branches of the frond.

Webber also reports that structures similar in position and appearance to those he describes upon *Lomentaria* were discovered upon *Champia parvula* by Dr. W. A. Setchell, who thought them to be the antheridia. The writer has, however, observed upon *Champia* the development of secondary organs of attachment resembling those of *Lomentaria*, which are without doubt the structures noted by Dr. Setchell.

After making the observations upon *Lomentaria* which led to the discovery of the true nature of the organs described by Webber, and to the undoubted fact that the antheridia of *Champia* were still undescribed, a careful investigation was made, both upon living and preserved material, into the structure and development of the organs found upon *Champia*.

When this examination had been practically completed, an article upon the development of the cystocarp in *Champia* by Dr. B. M. Davis (8) appeared in the *Botanical Gazette*. In this paper he mentions the fact of having found antheridial plants of *Champia* and states that in one instance the same plant bore both antheridial and cystocarpic branches. The structure of the antheridia is said to be somewhat similar to that in the genus *Lomentaria* described by Webber. Since this paper by Davis did not describe in detail the structure and development of the antheridia, it seemed best to the writer to publish the results of his own investigations.

In connection with the observation made by Davis that in one instance he found both antheridia and cystocarps upon the same plant, it does not appear to the writer, after a careful examination of all the material collected by him, that such a condition is a common one. Careful search was made with a view to ascertaining whether the antheridia were borne upon distinct forms, or upon the cystocarpic and tetrasporic plants. Upon the two latter forms no antheridia were discovered, but in two instances antheridial plants were found to have fused with cystocarpic and tetrasporic plants after growth was well advanced. It seems possible that the plant mentioned by Davis as producing both cystocarps and antheridia might have been a case of fusion of this character.

The antheridial plants of *Champia parvula* resemble, in their principal characteristics, the cystocarpic and tetrasporic plants. They occur in brownish-red globose tufts, varying from one half-inch to two inches in height. In general the plants display the profusely branching habit, and hollow nodose structure, with the frequent diaphragms, and longitudinal hyphæ which characterize the genus.

The antheridia appear as whitish zones or patches upon any of the peripheral cells of the frond, and become so densely filled with contents that they give to the internodes a swollen appearance which aids in the identification of the male plants. When full grown, the antheridia closely cover and entirely conceal the surface of the frond. The antheridial cells are then so densely filled with the highly refractive protoplasm that they give to the surface of the frond a glistening appearance.

The first stage in the production of antheridia is seen in the swollen appearance of the internodes. The peripheral cells become densely filled with contents and distended to a marked degree. This distention is due to an increase in the amount of cytoplasm, and also to the presence, in rather large quantities, of a granular substance staining brownish-red with iodine, and apparently resembling Floridean Starch.

The swelling of the peripheral cells is evidently preparatory to the division which now takes place. From the outer corners of these cells there are cut off from one to three cells upon which the branches which subsequently develop are borne, and to which the name of stalk-cells may be given. When seen in surface view (Fig. 1. s.), the stalk-cells appear as small, highly refractive cells lying at the corners of the peripheral cells. Viewed in section (Fig. 2. s.) it is seen that they are cut off obliquely from the peripheral cells, and by increasing in size, at length rise slightly above them. They usually increase in length but not in diameter, so that they frequently assume the shape of a flask, with the neck prolonged above the peripheral cells. (Fig. 2. s.) The protoplasm of these cells is usually more densely granular, and much more refractive than that of the peripheral cells, while in some cases a chromatophore and minute quantities of the starch-like substance before mentioned are present. The cutting-off of the stalk-cells from the peripheral cells constitutes the second stage of antheridial development.

In the third stage, division takes place in the stalk-cells. As a result of oblique division of the outer half of these cells, from one to three cells are first cut off. (Fig. 2. f.) These increase in size principally in length, and then divide in a plane nearly parallel with their longest axis. The cells produced by this division repeat the process, until at length there are formed rows of cells which usually radiate outwards in every direction from the stalk-cells. (Figs. 2 and 3.) These cells, to which the term filament-cells may be applied, sometimes produce at their apices by horizontal division, secondary filament cells, upon which antheridial mother-cells may be borne, while the stalk-cell frequently gives rise to a secondary filament-cell at its apex. A single antheridial cluster would show (Fig. 4) at this point in its growth, the large stalk-cell surmounted by numerous radiating rows of filament-cells densely filled with finely granular, highly refractive protoplasm.

The fourth and final stage of growth is the development of the antheridial mother-cells. (Fig. 5. a.) These are cut off singly or in pairs by horizontal or oblique divisions from the apices of the filament-cells. They may be spherical or somewhat cylindrical in shape, and of varying size, having a diameter of about 5 μ and a length of 10 μ to 12 μ. So far as could be ascertained, they contain only finely granular substance of a highly refractive nature, which gives them the glistening appearance, before mentioned, when seen in surface view.

A summary of the stages of development of the antheridia shows the following points.—

1. The peripheral cells of the frond become densely filled and swollen with protoplasmic contents.

2. Antheridial stalk-cells, densely filled with protoplasm

and in some cases containing chromatophores, are cut off from the upper corners of the peripheral cells.

3. Filament-cells, containing dense and highly refractive protoplasm, are cut off, first from the stalk-cell, and then in succession from each other, forming radiating rows of filament-cells.

4. The antheridial mother-cells are produced, singly or in pairs, from the outer corners or apices of the filament-cells.

5. The various cells which compose an antheridial cluster are cut off from each other by divisions which take place obliquely to the organic longitudinal axis of the cell.

The material used in the preparation of this paper was preserved in 1% formalin. Sections were made with the microtome, and preparations, made by crushing portions of the frond upon the slide, were frequently employed. The freezing microtome as described by Mr. W. J. V. Osterhout in a recent paper (9) was found extremely useful. Portions of the tissue of the frond were mounted in a solution of gum arabic upon the freezing chamber of the microtome, frozen and cut. The sections were at once transferred to the slide and mounted in glycerine jelly.

In conclusion the writer desires to acknowledge his indebtedness to Dr. W. A. Setchell who has kindly made a number of valuable suggestions in connection with the preparation of this paper.

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2. **Farlow, W. G.** Marine Algae of New England; p. 156. 1881.

3. **Hauck, F.** Die Meeresalgen; pp. 153 and 157. 1885.

4. **Debray, F.** Sur la Structure et la Developpement des Chylocladia, Champia et Lomentaria. Bull Sci. de la France et de la Belgique. Tom. XXIII; pp, 399—416. 1890.

5. **Webber, H. J.** Note in Annals of Botany, Vol. V; pp. 226—227, 1891.

6. **Hauptfleisch, P.** Die Fruchtentwickelung der Gattungen Chylocladia, Champia und Lomentaria. Flora, Bd. 75; pp. 307-367, Taf. 7-8, 1892.

7. **Buffham, T. H.** On the Reproductive Organs, especially the Antheridia, of some of the Florideæ., Jour. Quekett Mic. Club, Ser. II, Vol. IV; pp. 246-253. Pl. XV, XVI. 1890. On the Antheridia, etc. of some Florideæ. *Ibid.* Ser. II, Vol. V; pp. 291-305, Pl. XIII, XIV. 1893.

8. **Davis, B. M.** The Development of the Cystocarp in *Champia parvula.* Botanical Gazette, Vol. XXI; p. 111, pl. VII. figs. 1 and 2. March, 1896.

9. **Osterhout, W. J. V.** A simple freezing device. Botanical Gazette, Vol. XXI; p. 195. April, 1896.

EXPLANATION OF PLATE.

Figs. 1-4 are drawn with the aid of the Abbe Camera from microtome sections.

Fig. 5 is drawn from formalin material, crushed on slide.

The letters indicate the various cells as follows;—p, peripheral-cells; s, stalk-cells; f, filament-cells; a, antheridial mother-cells.

Fig. 1, x 240. Figs. 2—5, x 750.

BOTANICAL REMINISCENCES OF SAN FRANCISCO.

By H. H. Behr, M. D.

History has preserved for us the general features of the secular changes in the flora of some countries but without enabling us to distinguish between the mild work of nature producing gradual changes and the violent impetuous work of man subjecting nature to serve his purposes—what we call civilization.

While in former times, and even now in barbarous countries, most of the changes in vegetation were preceded by destructive warfare and devastation, in our era it is not so much the tearing down, it is the building up that produces these changes, which occasionally are so sudden that a sufficient number of individuals of our own species live long enough to recollect, and eventually note down, what has become extinct and what has been added to the Flora of a region.

The commemoration of such instances is not only of general interest, it is also instructive, as it frequently gives a clue to the methods of nature in producing such changes.

Here in San Francisco we have ample field for such observations, but notwithstanding the rapidity of the changes it is high time to fix these observations in print, because the generation which has witnessed them is fast disappearing.

The landscape which extended in the year 1850 to 1860 from Mission Creek to the range of hills at present split by the Second Street cut, was in its greater part filled by swamp and bog and Salicornia flat. A turfy fresh-water formation, inland, gradually merged into the Salicornia flat and was crossed by the serpentine courses of the tide creeks.

This formation was the basis for a system of sand downs overgrown by shrubbery, or occasionally arborescent vegetation. The downs were mostly arranged in parallel ridges, the ridges being most numerous and frequently confluent towards the mouth of Mission Creek. There were no sand downs on the other side, and its vegetation exhibited an entirely different character, depending on hills of serpentine rock and its debris.

In the direction of the range, now crossed by the Second Street cut, the sand hills diminished in number and size, the ridges became gradually isolated and stopped entirely at a wide flat, in a locality which is now bordered by Sixth and Third Streets, and entered in a very deep, boggy branch, the sand down region, beyond what is now Mission Street.

The ridges which enclosed this branch were higher than the rest and reached in considerable elevation the line of

Howard Street, where they formed a very abrupt boundary between sand and bog.

The deep, boggy branch that crossed Mission Street, where the swamp formed a valley encircled by deep downs, was the seat of a peculiar, now almost extinct Flora, at least as regards the neighborhood of San Francisco. This locality was the only one inhabited by the now extinct *Arenaria palustris*, which grew there in company with *Bidens chrysanthemoides*, *Cicuta Californica*, *Œnanthe Californica*, *Hydrocotyle*, *Nuphar polysepalum*, *Typha latifolia*.

An arm of this swamp, then inaccessible, even to cows, followed the side of Howard Street, down, bordering the flat as far as what is now Fifth Street, where it became overgrown by arborescent vegetation and ended in a thicket of *Myrica Californica*, *Ceanothus thyrsiflorus*, *Garrya elliptica*, *Salix*, *Woodwardia radicans*, *Asplenium Filix-fœmina*, *Aspidium aculeatum* and *Aspidium munitum*, the latter with almost arborescent trunk.

As a curiosity, we have to mention several shrubby specimens of *Cornus Nuttallii*, now entirely extinct in this region, its nearest habitat being Bolinas Ridge in Marin County, and even there it is not common.

There were several valleys beyond the steep ridge which bordered the swamp towards the West. Their chief direction was parallel to the ridge and they were dry and grassy. Their vegetation was about the same as that found now on spots where it has been protected in the cemeteries and Golden Gate Park.

It was in this region where a few specimens of *Botrychium ternatum* grew, a plant of the Sierras, now entirely extinct in our vicinity. The chief difference between the vegetation of this region and that of the sand downs and vales, similar to those now protected by the enclosure of Golden Gate Park was the great abundance of annuals, most of them strictly vernal. I recollect chiefly the different species of *Erythræa*, then frequently collected and much thought of by the old inhabitants, who used all the species, under the name

Conchalagua, against the intermittent fevers, dyspepsia, etc.

This vegetation disappeared in summer without leaving any trace, and, only where subterranean water courses approached the surface, luxuriant bunches of *Baccharis Douglasii*, *Erigeron Philadelphicus*, *Aster Chamissonis* and *Helenium puberulum* covered the ground, occasionally overspread by the flowering Twin-berry, *Lonicera involucrata* with its shining black berries in their dark red involucres, or *Sambucus glauca* and *Ribes glutinosum*.

These moist spots became confluent towards the North but towards the South the steep declivity of the ridge separated, in a very decided way, dry sand and inaccessible bog without any intervening transitional formation.

The bog itself was perceptibly lower at the foot of the hills than towards its center, which was occupied by a characteristic swelling of the turf, which gave origin to a net of interwoven little water-courses, permeating a kind of meadow and themselves covered by a moss-like carpet of an Azolla. The water seemed remarkably clear, but nevertheless deposited on the stems and lower leaves of grasses and herbs a thick ochraceous crust.

The vegetation of this locality was exceedingly characteristic. It was a kind of Arctic oasis amidst a vegetation of California type.

Where the water collected into small rivulets, it became hidden under the dense, mossy, and very deceiving carpet of Azolla. The turf consisted to a great extent of Cyperaceae, especially Scirpus, Carex, and, in one locality, even an Eriophorum. Out of this turf emerged the fragrant *Habenaria leucostachys* and *Menyanthes trifoliata* and, in one locality, *Epipactis gigantea*, with *Sisyrinchium bellum*. These were the most conspicuous and at the same time the most frequent plants of the formation.

Where the rivulets approached and extended to the serpentine courses of the tide water creek, the formation changed; the Azolla carpet dissolved into floating islands before disappearing entirely, the grasses and Cyperaceae lost their dense turfy appearance and developed higher stems with more conspicuous inflorescence and fewer leaves. Only on the margin of the creeks was developed the characteristic luxuriant turf of *Distichlis maritima*, frequently grown over by *Grindelia robusta*.

Then followed the Salicornia flat, here and there ornamented by *Cordylanthus maritimus* and *Frankenia grandifolia*, abruptly ending in a boggy marsh without any vegetation. Here was the mouth of the serpentine creek, the receptacle of all the watercourses of the flat.

The mouth of the creek was bordered on its left side by a flat ridge of coarse, dry sand without grass, but sparsely overgrown by *Frankenia*, *Statice Limonium* var. *Californica* and *Heliotropium Curassavicum*.

Species entirely extinct in this region and not found elsewhere:

Arenaria palustris, Watson. (This may, some day, be rediscovered in Alaska).

Species extinct in this region but found in other parts of California:

Menyanthes trifoliata, L.
Heliotropium Curassavicum, L.
Cornus Nuttallii, Audubon.
Epipactis gigantea, Dougl.
Habenaria leucostachys, Watson.
Fimbristylis miliacea, Vahl.
Botrychium ternatum, Swartz.
Eriophorum (species unknown).

Arbutus Menziesii Pursh. This consisted of a single specimen at the brim of one of the ridges, about twenty feet above the turfy level of the swamp, in a locality now covered by Seventh Street, between Harrison and Folsom. It was a straggling tree growing amidst shrubby *Quercus agrifolia* and *Ceanothus thyrsiflorus* only to be distinguished from *Heteromeles* when in flower.

Species that have disappeared only from the immediate neighborhood, but still found within the county:

Garrya elliptica, Dougl.
Frankenia grandifolia, Cham. & Schl.
Corallorrhiza multiflora, Nutt.
Sisyrinchium Californicum, Ait. f.
Aspidium munitum, Kaulf.
Asplenium Filix-fœmina, Bernh.

TWO NEW CRUCIFERÆ.

By Edward L. Greene.

Thelypodium amplifolium. Biennial, 2 to 5 feet high, rather slender, somewhat paniculately racemose above, glabrous and very glaucous throughout: radical leaves 6 to 12 inches long including the very distinct and rather slender petiole, the lamina elliptic to obovate-lanceolate, obtuse, entire, thin, with several pairs of rather prominent veins; the cauline 2 or 3 inches long, of narrowly lanceolate outline, sessile by a deeply sagittate base: flowers in several rather loose racemes; petals, lilac-purple, 4 or 5 lines, long, the lamina narrow, obtuse: fruiting racemes a foot long; pods narrowly linear, abruptly slender-beaked by a conspicuous style, about 2 inches long, slightly curved upwards on spreading pedicels of an inch long or less.

A fine large showy species, found by the writer in Pine Valley, Nevada, 25 July, 1896. The soil in which it grows is moist and rather strongly alkaline. The large radical leaves are most unlike those of any other *Thelypodium*.

Stanleya bipinnata. Perennial, rather low, seldom 2 feet high, the stem flexuous, very leafy: herbage very glaucous and pale, sparsely pubescent with stiffish straight or curved short hairs: leaves of ovate outline, bipinnately divided into exceedingly numerous but remote small segments, or those next the inflorescence simply pinnate: racemes short-peduncled narrow but dense; flowers yellow; buds cylindraceous; claws of the petals tomentose, nearly thrice the length of the glabrous limb, this erose-dentate at summit; the ovary and its stipe hispidulous: very narrow pods torulose and tortuous, the stipe about equalling the pedicel.

Collected by the writer, on a small tributary of Rock Creek in southern Wyoming, 11 July, 1896. It will be the second species of this interesting genus which Wyoming has furnished; the other being *S. tomentosa*, belonging as far as known to the northwestern part of the State. But that species and this new one are not especially related to each other, although both are distinguished from other members of the genus. *S. bipinnata* is nearly related to the original *S. pinnata*, from which it is most readily distinguishable by its finely dissected foliage and distinct though sparse pubescence.

SHORT ARTICLES.

Endarachne Binghamiæ: — J. G. Agardh, the veteran algologist, Professor at Lund in Sweden, has just published a third part of his "Analecta Algologica." Several new genera and species are described from different parts of the world. California is represented by *Endarachne Binghamiæ* a new genus and a new species, which includes some, if not all, of the forms of the West coast usually referred to *Phyllitis fascia* Kuetz.—W. A. Setchell.

Abies bracteata:—Professor C. S. Sargent on a recent trip into the Santa Lucia mountains obtained fruiting specimens of the rare and local *Abies bracteata*. The cones are infested with the larvæ of some insect and very few seeds are untouched. Perhaps this is the reason why the species is represented by so few individuals, a few hundred at the most being Professor Sargent's estimate of their number.

Like *Pinus Torreyana, Abies bracteata* is restricted in range to one small area, the Santa Lucia mountains of California being the only known locality for the species. It occurs at an altitude of 3,000 to 6,000 feet.—ALICE EASTWOOD.

CENTAUREA CALCITRAPA, L.:—This species is found throughout almost the whole of Europe, in parts of Asia Minor and on Islands of the Mediterranean. In the Synoptical Flora it is recorded as "sparingly established at seaports from New York southward, chiefly as a mere ballast weed:" it has appeared also in California, Mr. Jepson having collected specimens at Vacaville, Solano county, in August, 1887. Recently I collected it in San Mateo county, not far from San Mateo, on the road to Crystal Springs lake: at present there are but two or three plants, but it is likely to spread, as *C. Melitensis* and *C. solstitialis* have done. The plant is about 2 feet high, diffusely branched, and forming bunches. The flowers are rose colored, the involucral bracts being armed with long, spreading, rigid, yellow spines. The leaves are sessile, pinnatifid, not decurrent as are those of *C. solstitialis* and *C. Melitensis.*—ALICE EASTWOOD.

RECENT INTRODUCTIONS INTO CALIFORNIA:-*Physalis Philadelphica*, Lam. Miss Eastwood informs me that several plants of this species occur on the road between Piedmont and Moraga Pass, in Alameda county. It is evidently an "alien," escaped from some garden where the plant has been cultivated for the sake of its edible fruits.

The term *alien* as here used is borrowed from Hewett Cottrell Watson's celebrated Topographical Botany of the British Islands. In this work the author classifies the doubtfully indigenous species as "aliens," "colonists," and "denizens." He defines these terms as follows:

"A denizen is a species suspected to have been introduced by man, and which maintains its habitat. A colonist is one found *only* in ground adapted by man for its growth and continuous maintenance. An alien has presumably been introduced by human agency."

The remark of Sir Joseph Hooker with regard to Great Britain, that the vagueness of these definitions is unavoidable, and their correct application in many cases exceedingly difficult, applies equally to California.

Scolymus Hispanicus, L., reported on p. 145, can scarcely be considered a "denizen" as yet. It proves to have been introduced by some people living in the neighborhood who bought the seed from an eastern seedsman under the name of "Spanish Oyster Plant." It will be interesting for anyone visiting Los Gatos from time to time, to note whether it is inclined to spread; the precise locality where Miss Cannon found it, is the hillside above the El Monte Hotel.

Solanum elæagnifolium has recently been sent to me by Mr. James E. Hughes of Fresno, who reports that it was introduced onto his ranch some eight years ago, during which time it has spread over five acres of land, and is now beyond his control. The long woody roots of this weed make it very troublesome to eradicate. In 1895 Mr. S. B. Parish recorded that it was well established by roadsides at South Riverside. —J. BURTT DAVY.

BARON VON MUELLER:—The Chamisso Botanical Section of the Science Association of the University of California has passed the following resolution: Whereas the Chamisso Botanical Section of the Science Association of the University of California has heard of the death of Sir Ferdinand Baron von Mueller, Government Botanist of Victoria, therefore be it

Resolved: That the Section hereby expresses its deep sense of loss sustained by the removal of Baron Mueller after a long life rich in contributions to scientific knowledge. We feel that his persevering industry in the cause of botany and agriculture, and his liberal generosity in the dissemination of information, as well as of seeds and specimens of useful and interesting plants, unfettered by mere personal or even national considerations, are most worthy of emulation. California owes an especial debt of gratitude to Baron Mueller for the introduction of the Saltbush (Atriplex semibaccatum) and several valuable species of Eucalyptus and Acacia. Furthermore be it

Resolved: That a copy of these resolutions, signed by the President and Secretary of the Section, be offered to the Editor of *Erythea* for publication, and that another copy thereof be forwarded, by the Secretary of the Section, to the government of Victoria.

MISCELLANEOUS NOTES AND NEWS.

THE *Gardeners' Chronicle* records the death, on August 10th, of Nicholas Funck of Luxembourg at an advanced age. In 1835, Funck started with Linden on his explorations in tropical America, in search of natural history objects. Large collections of specimens, zoological and botanical, were sent home, some of which are not even yet elaborated, They afterwards explored some of the West India Islands, Mexico and Northern Guatemala.

Mr. **MARSHALL A. HOWE** is at the herbarium of Columbia University, N. Y., working up his Californian collections of Hepaticæ.

IT IS with great regret that we learn by telegraph of the death on October 9, of Sir Ferdinand Baron von Mueller Government Botanist of Victoria. We hope to print a notice of the Baron's life and work in our next issue.

ANOTHER issue of Prof. Greene's *Pittonia* has reached us, being Part 14, or pp. 33-90 of Vol. iii. This Part contains Critical Notes on Certain Violets, Studies in the Compositæ, iii, New or Noteworthy Species, xvi, by Prof. Greene, and Economic Botany of S. E. Alaska, by W. J. Gorman.

Pittonia may be obtained from Payot, Upham & Co., San Francisco, or William Wesley & Son, London.

Dr. F. Franceschi has a note on the Blue Palm of Lower California, *Erythea armata*, in the Gardeners' Chronicle for Oct. 10, 1896, (Ser. 3, Vol. xx, p. 424), illustrated from a photograph of a fine specimen growing at Montecito near Santa Barbara, southern California. Curiously enough the name has been misprinted Erythrea, throughout Dr. Franceschi's article as well as in the list of contents, thereby despoiling it of its pleasing reference to mythology, and falsely indicating some kinship with the Gentianaceous Erythrœa, or at least with the Greek word for *red* from which this latter name was derived, a connection quite inapplicable in this case.

Miss Eastwood has issued a report on her collection of plants of San Juan county, south-eastern Utah, made in July, 1895. The report occupies sixty pages of Volume vi, (second series) of the Proceedings of the California Academy of Sciences. Out of 162 plants enumerated the following are described as new: *Polygala acanthoclada* var. *intricata*, *Linum aristatum* var. *subteres* Trelease, *Psoralea juncea*, *Mentzelia pterosperma*, *Houstonia saxicola*, *Grindelia stylosa*, *Chrysopsis villosa* var. *scabra*, *Aster canescens* var. *aristatus*, *Erigeron sparsifolius*, *Dicoria paniculata*, *Cnicus Rothrockii* var. *diffusus*, *Gilia congesta* var. *nuda*, *Oxybaphus angustifolius* var. *viscidus* (misprinted Oxyaphus), *Abronia turbinata* var. *marginata*, *Atriplex Caput-Medusæ*, *Eriogonum cernuum* var. *umbraticum*, *E. Wetherillii* and *E. ramosissimum*.

THE ELK-KELP.

By William Albert Setchell.

One of the most interesting of the giant Laminariaceæ of the Western Coast of North America, is the so-called Elk-Kelp or Bull-Kelp of the southern waters. Extending from the peninsula of Lower California, where it was found at Todas Santos Bay by Prof. and Mrs. Carl Eigenmann (cf. Farlow, Bull. Torr. Bot. Club, XVI; 7, 1889), it is best known from the region about San Diego, where it has been collected by Mr. Daniel Cleveland and Prof. Eigenmann. The type specimen, however, was procured at the Island of Santa Catalina by Dr. Gustav Eisen, although credited by Areschoug to the neighborhood of San Francisco. It has never been recognized so far north as San Francisco, but does certainly occur in the Santa Barbara Channel, although exact data and specimens are not available to the writer at present. Battered specimens are occasionally cast ashore, even as far north as Santa Cruz, but always after severe storms from the south, according to Dr. C. L. Anderson, who has collected them.

The Elk-Kelp, then, is a plant of the waters below Point Conception, where it takes the place of the more northern *Nereocystis Luetkeana.* Much fuller information is needed as to the distribution of both of these forms before the exact limits of their range can be determined. *N. Luetkeana* is the northern form, being said to occur upon the shores of Kamtschatka (cf. De Toni, Sylloge Algarum, III; 368, 1895), at the Island of Sitka, Puget Sound, and upon the shores of California down to Santa Cruz and Monterey. The writer has found it cast ashore at Port Harford, in San Luis Obispo County, and there is considerable reason for believing that it occurs, also, near Santa Barbara, in company with *N. gigantea.* Mr. Cleveland has never seen it in the waters about San Diego, nor did it occur to the writer in the neighborhood of San Pedro, although *N. gigantea* was fairly abundant. It seems, therefore, that these two species divide the California Coast between them, overlapping, probably, at Santa Barbara.

The type specimen, obtained by Dr. Gustav Eisen, was described by Areschoug in the Botaniska Notiser for 1876, as *Nereocystis gigantea.* In an article in the same journal for 1881, Areschoug separated it from *N. Luetkeana*, making it the type of a new genus, *Pelagophycus.* The full description of *Pelagophycus giganteus* was not given, however, until three years later, in the fifth part of the "Observationes Phycologicæ." A. B. Hervey has described it, in his popular book on Algæ (Sea Mosses; 86–87, 1881) and Farlow, in the Bulletin of the Torrey Botanical Club for 1889 (XVI; 7–9) has added much information concerning it, furnished to him by Mr. Cleveland. The latter furnishes the most complete account of the morphology of the species, that we possess.

The writer made the acquaintance of the Elk-Kelp in December, 1895, in the waters between the mainland and Santa Catalina Island, near the locality where it was collected by Dr. Eisen. The first specimens found by the writer, were cast ashore upon San Pedro Beach and as they lay upon the sand, with the branches stretched out from the bladder, the resemblance between their extended arms and the antlers of a stag, was certainly very striking. These specimens, of course, were very imperfect, lacking holdfasts entirely and retaining only fragments of the leaves.

Soon after, numerous specimens were found entangled among the *Macrocystis*, which forms, there, a belt along the coast extending out to the 10-fathom line, but all these lacked holdfasts and had more or less imperfect leaves. It was only outside of the 10-fathom line, in open water of 12 fathoms or more, that perfect specimens were found. Numbers were seen several fathoms deep, entirely out of reach, but a few were found with the bladder floating upon the surface, and the lower portions loosened from the bottom, but with the holdfast and adjacent parts of the stipe still entangled among the attached plants. Careful manipulation procured two complete plants, one of which is represented in the photograph reproduced upon Plate VII.

In each case the holdfast was still attached to a small stone, and was about the size of a man's two fists. The small size of the holdfast, in this case, is in great contrast to that of *Macrocystis* which is often a meter across. The hapteres are produced in several, fairly regular whorls, at the base of the stipe and are several times regularly dichotomously branched, the ultimate branchlets being very slender and somewhat fasciculate.

The stipe is solid at the base, perfectly terete and very slender. It increases very gradually and very slightly in diameter for about 6.7 meters in each specimen. Then it becomes abruptly swollen for a distance of about 80 centimeters and is hollow within. This swollen, hollow portion is more or less abruptly and distinctly marked off from the lower solid portion, and very sharply separated from the bladder above by a deep constriction. The upper swollen portion of the stipe in *N. Luetkeana* is also distinctly marked off from the bladder and from the lower part of the stipe, although not so distinctly as in *N. gigantea.* It will be very convenient to designate this swollen portion in both species as the *apophysis.*

The bladder is nearly spherical, 18 to 20 cm. in diameter, and is separated from the apophysis by a deep constriction, much more pronounced than that of *N. Luetkeana.* In the latter species, indeed, there is frequently no constriction at all. The cavity of the bladder communicates with that of the apophysis by a narrow canal, 3 to 5 cm. in length and of the diameter of a goose-quill. The connecting cavities of bladder and apophysis, both in *N. gigantea* and in *N. Luetkeana,* are filled with a gas of some sort, so long as the plant is alive and uninjured. A number of specimens of both species were examined carefully to test this point and in no instance was any water found inside, except in the case of injured specimens. In specimens thrown ashore, considerable water is often found inside, but there is always present either a hole through the wall, or else a spot where the tissues of the wall are soft and dead. The writer was led to examine carefully into this matter, because of the generally accepted statements that the bladders contain water. Mertens, as quoted by Harvey in the Nereis Boreali-Americana (Part I; 87.) says: "The opening of the bladder and the discharging of the water which it uniformly contains, only hastens the process of decomposition." Farlow, also, quotes Cleveland as saying: "The upper bladder contained about one-half pint of water," (cf. Bull. Torr. Bot. Club, XVI; 8, 1889.) According to the writer's experience, it certainly seems as if the specimens upon which the above accounts were based, must have been injured in some way, so as to allow the entrance of water from the outside. When an uninjured bladder was pierced by a knife-blade, a "sucking" noise was heard and any moisture which happened to be left on the outside of the bladder at that point, was drawn inside.

The two arms rise almost immediately from a common point of origin upon the top of the bladder. The point of union projects only a few centimeters from the top of the bladder. The arms themselves are two in number and reach a length varying from 1.3 to 1.6 meters. They are very decidedly flattened, are solid, and bear, in all the perfect specimens examined by the writer, six large leaves, arranged in a row upon the upper side of each.

The leaves, in perfect specimens, are ample, very thin and very brittle, so much so, in fact, that it was only by exercising the greatest care that they could be withdrawn from the water and taken into the boat. A sudden or hurried pull upon them caused them to split transversely. They become very brittle in drying and are always lost in preparations of the whole plant.

The leaves are borne upon petioles 23 to 25 cm. long, which are fairly stout below, but are contracted suddenly just at the bases of the leaves. This is very well shown in the specimen represented upon Plate VII. The blades of the leaves reach a length of from 4 to 5.5 meters and their width varies up to 46 cm. They are very decidedly, and more or less broadly, cuneate at the base and the borders are ample and loosely ruffled. The margins are generally provided with more or less remote spine-like projections, which, also, may occur sparingly upon the surfaces of the blade. In one specimen obtained, these spine-like projections were entirely wanting. The surfaces of the blades are coarsely and transversely rugose, as is represented very well in the accompanying figure.

The most noticeable features of the leaves are their length, their cuneate bases, and the fact that they are bilaterally symmetrical. Areschoug says that the leaves, in the single specimen which he possessed, were 5.6 meters long, much as in the specimens obtained by the writer. Cleveland's specimen, described in Farlow's paper, is said to have leaves "3 to 4 inches broad, and from 2 feet and upwards in length."

The method by which the leaves originate, is unknown. In *N. Luetkeana*, there is at first a single blade. This divides into two, and each of these divides again, making four blades. These four blades form the centers of activity during the rest of the division. Equal divisions and subdivisions take place in them and their derivatives with a fair amount of uniformity, the blades developing and thickening short petioles, which branch until finally there exist 4 sets of petioles, branched dichotomously in turn, four to five times, and bearing narrow blades, in all about 64. The blades in all the specimens of *N. gigantea* examined by the writer, numbered six to each arm, one upon the tip of each petiole. Areschoug's specimen had four blades upon each petiole. The number of blades is not given for Cleveland's specimen, but he speaks of the petioles ("branches") as forking once in each case, whereas, in the specimens both of Areschoug and of the writer, the petioles are simple.

This forking certainly points towards the origin of these blades from one original blade, by successive, longitudinal splittings, such as are characteristic of the Lessoniideæ. The origin of the blades in *N. Luetkeana*, is by successive, equal, longitudinal splittings, and this species is consequently referred without question to the subtribe Lessonieæ. The blades of *N. gigantea* must arise, after the first division, by unequal longitudinal splitting and, consequently, this species seems to belong rather to the subtribe Macrocysteæ. Specimens of the earlier stages of development are needed, however, for ascertaining the exact details.

No fruit was found by the writer upon any of the specimens examined, and they seemed not to have reached by any means their full development.

Plate VII. *Nereocystis gigantea* Aresch., from a photograph of a specimen collected in 12 fathoms of water near San Pedro, California.

NOTES ON THE FLORA OF HUMBOLDT, TRINITY AND SHASTA COUNTIES.

By W. C. Blasdale.

During the first three weeks of the month of June of the present year, it was my good fortune, in company with Mr. M. A. Howe, to make an extended collecting trip across the central portions of Humboldt, Trinity and Shasta Counties. Though such a rapid survey of the country was necessarily a a very incomplete one, it has seemed advisable to place on record some few notes on the flora of this little-known region.

Starting from Eureka, our route lay up the valley of the Mad River for a distance of forty-five miles, thence across Pilot Ridge and South Fork Mountain to the South Fork of the Trinity River at the little hamlet of Hyampum. Thus far it corresponded with that pursued by Drew and Chesnut in 1888 at a considerably later season of the year (see Botanical Gazette XVI, 147.) Following up the Hay Fork of the Trinity to its source, we next traversed the intricate plexus of low mountain ranges that make up the western part of Trinity County, passing through Douglass City, Deadwood City, thence over the divide into Shasta County, and finally to the town of Redding by way of the stage-road.

The diversity of soil and climatic conditions thus presented was exceedingly great and was well illustrated by the various distinct floras encountered.

The region about Humboldt Bay lies in the very heart of the redwood belt, which is here nearly twenty miles in width and has already been pierced through by the ever advancing encroachments of the logging camps, though a few tracts of virgin forest still remain within a short distance of Eureka. An annual rainfall that often exceeds fifty inches, and the prevalence of heavy ocean fogs, present favorable conditions for the development of coniferous trees, and besides the luxuriant growth of redwoods that give prosperity to the county, are found splendid examples of *Pseudotsuga taxifolia*, *Abies grandis*, *Picea Sitchensis*, *Tsuga Mertensiana*, and more rarely *Chamæcyparis Lawsoniana* and *Taxus brevifolia*. Of all these none exceed in symmetry of form and beauty of foliage the "tide-land spruce," *Picea Sitchensis*. Beneath the dense shade of these trees is found that assemblage of more humble plants so distinctively characteristic of the redwood belt. Some of the more striking features of this are, tangled growths of *Rubus spectabilis*, *Brossæa Shallon*, *Berberis nervosa*, *Vaccinium parvifolium* and *Rhododendron Californicum*, great matted clumps of *Lomaria spicant*, *Aspidium munitum* and *A. spinulosum* var. *dilatatum*, and nearer the stream-margins a great abundance of saxifragaceous plants, representing the genera *Heuchera*, *Therofon*, *Tiarella*, *Mitella* and *Whipplea*. Beneath all is found a verdant carpet of *Oxalis Oregana* frequently interspersed with such plants as *Anemone deltoidea*, *Vancouveria parviflora*, *Cardamine Breweri*, *Viola sarmentosa*, *Lotus crassifolius*, *Scoliopus Bigelovii*, *Clintonia Andrewsiana*, *Maianthemum bifolium*, and *Achlys triphylla*.

As one passes inland the redwood gradually gives place to the Douglas spruce, the tan-bark oak and the madroño, and when one reaches the so-called "prairies" almost the only trees to be met with are occasional specimens of the Kellogg oak, though in the river-bottoms many of the common trees of central California are found. The elevated plains and hill-sides are for the most part covered with a luxuriant growth of grasses and clovers, especially *Trifolium fucatum* which is locally known as "bear clover" and is said to furnish good pasturage. Otherwise the flora has many features in common with that of the Coast-range foot-hills.

On the top and eastern slope of South Fork Mountain a heavy coniferous growth is again encountered, composed for the most part of the *Shastensis* variety of *Abies magnifica*, *Pinus Lambertiana* and *P. Ponderosa*, *Pseudotsuga taxifolia* and occasional specimens of *Libocedrus decurrens*. Further indications of a sub-alpine element in the flora of this ridge, which is said to be 6000 feet in height and at the time of our visit was still covered with snow-drifts, might be deduced from the appearance of *Veratrum Californicum*, *Capnorchis uniflora*, *Viola Sheltonii* and *Hydrophyllum occidentale* var. *Watsonii*. Soon after crossing this divide one begins to perceive evidences of a decrease in the humidity of the atmosphere, which becomes more and more pronounced as one approaches the great interior valley of the Sacramento River. The extremely broken character of the country gives rise to a much diversified flora and renders it difficult to institute any general characterizations. Of arboreal growths the yellow pine and Douglas spruce are prominent features, though seldom attaining the dimensions of the Sierra forms. A few specimens of the typical *Pinus Jeffreyi* were observed, while *P. Sabiniana* and *P. attenuata* are extremely common. Some of the most noticeable shrubs are *Cornus Nuttallii*, *Siliquastrum occidentale*, *Rhus trilobata*, a *Philadelphus* too immature to determine and *Prunus subcordata* which here, as in the Sierras, is so seriously affected with *Exoascus pruni* that it seldom perfects its fruit.

Though occasional lists of the plants observed were made, these are too incomplete to be of much significance and hence I shall confine myself to a few notes on some of the more striking ones.

Delphinium trolliifolium, Gray. Abundant in the pastures along Mad River and locally known to the stockmen under the name of "poison weed." The young shoots in early spring are frequently responsible for the serious illness or even death of cattle.

Silene Hookeri, Nutt. Found abundantly on the western slope of Pilot Ridge and also observed in Trinity County; the petals in all cases of a pure white color and not pale pink as stated in the "Botany of California."

Ceanothus velutinus, Dougl. A few specimens were observed growing in shaded canons near Kneeland's Prairie. Abandoning its usual habit it here assumes an arborescent form sometimes attaining a height of twenty feet and forming trunks five inches in diameter.

Astragalus Rattani, Gray. A pure-white flowered form was abundant as well as the normal blue in upland pastures along the Mad River.

Thermopsis montana, Nutt. This plant does not appear to have been reported from the State. The present specimens agree in all essential particulars with one from Arizona in the herbarium of the University of California.

Trifolium scorpioides, *sp. nov.* Stems very numerous, twelve to sixteen inches in length, stout, erect, from a thick perennial root; somewhat woolly or silky-villous throughout; stipules broad, foliaceous, acuminate-tipped; leaflets lanceolate, blunt at apex, serrulate, one to one and one half inches long; spikes on long peduncles, the floriferous part abruptly reflexed, while the flowers themselves are often reflexed and thus appear erect; calyx with filiform ciliated teeth scarcely equalling the corolla; corolla tawny yellow to white.

A somewhat remarkable addition to our already long list of Trifolia, but readily distinguished from them all by its peculiar floral habit. It is most nearly allied to the *T. plumosum* of Douglas but differs from that in the abundant pubescence, the much smaller leaflets, shorter and more slender peduncles and petioles, and the pronounced ciliation of the calyx; these cilia are produced almost at right angles to the teeth and give the younger heads a very pronounced plumose appearance. Collected but once, in hard gravelly soil along Mad River near the point at which it is crossed by the Hyampum trail.

Rubus leucodermis, Dougl. A peculiar form of this species was observed in the interior of Trinity County. Leaves small (one to two inches across), but slightly trilobed, the lobes irregularly toothed.

Sarcodes sanguinea, Torr. A few good specimens were obtained on the eastern slope of South Fork Mountain.

Crepis monticolor, Coville. Agrees very closely with the plant figured in Contributions from the U. S. Nat. Herbarium, Vol. III, Plate XXII, save for the more dense pubescence. Collected but once, near French Gulch, Shasta County.

Lithospermum Californicum, Gray. Differs in several respects from the description in the "Botany of California." Collected from the same station as the above.

Boschniakia strobilacea, Gray. Of common occurrence on South Fork Mountain and along the Hay Fork River. In all but a single instance found to be parasitic on the roots of *Arbutus Menziesii.* The exceptional case grew apparently on a species of Arctostaphylos. It produces on the ends of the roots of its host, hard warty structures which give rise to from one to six floriferous spikes, the latter sometimes attaining a length of eighteen inches yet seldom rising more than six inches above the surface of the ground, covered with numerous imbricated reddish-brown scales the upper ones each subtending a single flower. Calyx broadly cup-shaped, regular save for the awl-shaped teeth which vary from one to four in number, in flowers of the same spike and which follow no symmetrical arrangement; subtended below by two filiform bracts. Corolla reddish brown, barely two-lobed, the upper lip erect, the lower receding. Stamens and corolla long persistent, the former becoming exserted in fruit. Fruit globose, with four placentæ and filled with an abundance of favose seeds. The calyx characters on which the genus is largely based appear to be very unstable ones.

Digitalis purpurea, Linn. Naturalized and apparently perfectly at home about Eureka.

Lysichitum Camtschatcense, Schott. This is one of the most striking plants of our western flora. It attains its best development in the shaded swamps near the coast, where its leaves often attain a length of four feet and a breadth of fifteen inches. Fine specimens with their velvety, slightly-mottled, leaves would compare favorably with the Dieffenbachia products of our greenhouses. [This appears to be the correct spelling of the name "Lysichiton Kamtschatcensis" of the State Survey Botany and other works.—J. B. D.]

NOTES ON CYANOPHYCEÆ.—II.

By W. A. Setchell.

Calothrix Hosfordii Wolle, published in the Bulletin of the Torrey Botanical Club for 1881 (VIII; 38), is one of the forms mentioned by the writer, in a previous number of the current volume of this journal (p. 88), as being problematical and it is also placed by Bornet and Flahault (Revision (frag.) I; 370) under the list of "*Species Inquirendæ.*" Several years before his death, Mr. Wolle sent to the writer some of the original Hosford collection, but even traces of any Calothrix were lacking. Dr. Smith Ely Jelyffe of Brooklyn, N. Y., however, kindly sent to the writer some material collected by him upon submerged stones in Lake George, N. Y., in October, 1892, which Mr. Wolle had pronounced to be his *Calothrix Hosfordii*. The writer could not, at the time of the receipt of the material, distinguish it from *Dichothrix Baueriana* (Grun.) B. & F. Later, however, as he became better acquainted with the American species of Dichothrix, it seemed best to submit this specimen to Dr. Bornet, who recognized its distinctness from *D. Baueriana*, but still regarded it as a true Dichothrix. The species therefore should be called

Dichothrix Hosfordii (Wolle) Bornet.

Calothrix Hosfordii Wolle, Bull. Torr. Bot. Club, VIII; 38, 1881.

Calothrix Hosfordii Wolle, F. W. Algæ U. S.; 239, Pl. 169, fig. 1–4, 170, fig. 3–4, 1887.

Dr. Jelyffe's plant was not only determined by Wolle, but also, as Dr. Bornet points out in a letter to the writer, it agrees perfectly with Wolle's description. The trichomes are somewhat larger than in *D. Baueriana*, varying from 10–12μ in diameter, are bulbously inflated at the bases of the branches, with "skull-cap" shaped, light-blue heterocysts and with the branchlets closely placed together. In speaking of Wolle's figures, Dr. Bornet remarks that the figures upon Plate CLXIX represent accurately the shape of the branches but not the ramification, while the figures of Plate CLXX represent very well the details of ramification, but do not show the bulbous bases of the branches. All the figures upon Plate CLXX are from plants infested with a very slender species of Schizothrix.

Dichothrix Hosfordii (Wolle) Bornet, besides occurring near Charlotte, Vt. (type locality), and in Lake George, N. Y., has also been found at Ann Arbor, Mich., by L. N. Johnson; near Saugus, Mass., by F. S. Collins; and in different localities near New Haven and Bridgeport, Conn., by Isaac Holden and the writer. A set of the writer's specimens has been distributed in the fifth fascicle of the Phycotheca Boreali-Americana, under No. 2.

Sirosiphon pulvinatus of Wolle's Fresh Water Algæ of the United States is very evidently a tangle of forms as may be seen from the description (pp. 268–270), as well as from the figures (Plates 190–191). It evidently includes very much lichenized forms as well as those unaffected. The *Sirosiphon pulvinatus* of Brebisson and other European writers is the *Stigonema turfaceum* Cooke. A specimen distributed by Wolle as No. 29 of a collection entitled Fresh Water Algæ of the United States (which will be quoted below as Fresh Water Algæ of the U. S., (*Exsicc.*), to distinguish it from the volumes with the same title), belongs rather to *Stigonema informe* Kuetz., which includes the *Sirosiphon guttula* Wood. Wolle, however, refers Wood's species to *Sirosiphon lignicola* Wood, which, in turn, is made a synonym under *Stigonema minutum* (Ag.) Hassall by Bornet and Flahault. *Stigonema informe* Kuetz. is distinguished from *St. turfaceum* Cooke by the fact that the cells of each transverse band are larger and less in number in the former as compared with the latter.

Symphyosiphon Contarenii is said by Wolle in his article on Fresh Water Algæ numbered II, in the Bulletin of the Torrey Botanical Club for March, 1877, (VI; 139) to be abundant together with *Sym. incrustans* Kuetz., "on rocks exposed to the spray of Niagara Falls." No reference is made to this binomial which seems to be of Wolle's creation, in the Fresh Water Algæ of the U. S. The *Scytonema Contarenii* of Rabenhorst is placed by Bornet and Flahault in the list of "*Species Inquirendæ.*" A specimen distributed by Mr. Wolle in his Fresh Water Algæ of the U. S. (*Exsicc.*), labelled "*Symphyosiphon Contarenii*, —Rocks, Niagara, Aug. '76," is referred by Dr. Bornet to *Scytonema densum* (A. Br.) Bornet. This species has not been credited hitherto to North America, at least, in any authoritative fashion.

Symphyosiphon incrustans Wolle, (Bull. Torr. Bot. Club, VI; 139, 1877) has already been referred by Bornet and Flahault to *Scytonema crustaceum* var. *incrustans* (Kuetz) B. & F. The specimen distributed under No. 51 of Wolle's Fresh Water Algæ of the U. S. (*Exsicc.*) is evidently the same, but no reference to this name appears anywhere in the Fresh Water Algæ of the U. S. It seems, however, to be the same as his *Scytonema mirabile* (Bull. Torr. Bot. Club, VI; 217-218, 1879; and VI; 284, 1879; also Fresh Water Algæ U. S.; 255, Pl. 187, fig. 1-17, 1887), although it is neither the type nor definitely noted under any of the descriptions or localities.

Scytonema calotrichoides var. *natans* of Wolle, is known to the writer in a specimen sent to him by Mr. Wolle several years ago with no other data than the name. The *Scytonema calotrichoides* of Kuetzing is referred by Bornet and Flahault to *Scytonema figuratum*, which name became later *Scyt. mirabile* (Dillw.) Bornet, and to this species is referred also the *Scyt. calotrichoides* of Wood. Wolle's specimen is referable rather to *Scytonema tolypotrichoides* Kuetz. It is very plainly a floating species, of somewhat globose habit and has not been reported hitherto except from France, as far as is known to the writer. Wolle mentions it first in his Fresh Water Algæ of the U. S.; 251, Pl. 183, fig. 5–7, 1887.

Scytonema tolypotrichoides is first mentioned by Wolle in the Bulletin of the Torrey Botanical Club for 1877 (VI; 139). In his Fresh Water Algæ of the U. S., it appears again with the *Scytonema calotrichoides* of Wood as a synonym. Wolle's description of the habit and habitat of the plant makes it evident that he did not have in mind the *Scyt. tolypotrichoides* of Kuetzing. A specimen collected by Wolle at Niagara Falls in August, 1876, and distributed in the Fresh Water Algæ of the U. S. (*Exsicc.*) proves to be *Scyt. Myochrous* (Dillw.) Ag., and not *Scyt. figuratum* Ag. to which Bornet and Flahault refer Wood's *Scyt. calotrichoides* as well as Kuetzing's.

Scytonema Hegetschweileri of Wolle's Fresh Water Algæ, II (Bull. Torr. Bot. Club, VI; 139, 1877) was issued under that name as No. 60 of his Fresh Water Algæ of the U. S. (*Exsicc.*). Mr. Wolle says in the article just referred to, that it "forms a dark brown coating on the wet rocks" at Niagara and "differs very slightly from the European form." He also says in his disjointed fashion: "Probably the same plant Dr. Wood described under the name of *Sc. cataracta.*" As *Scyt. Hegetschweileri* does not appear in the Fresh Water Algæ of the U. S., while *Scyt. cataracta* does, it seems that the latter stands for this particular plant. Wolle also distributed it under Wood's name in Rabenhorst's Exsiccatæ (Algen Europas, No. 2492). The specimens under each name contain a mixture of *Scyt. Myochrous* (Dillw.) Ag. and *Scyt. mirabile* (Dillw.) Bornet.

Arthrosiphon alatus Rab. appears as No. 59 of Wolle's Fresh Water Algæ of the U. S. (*Exsicc.*), from rocks at Niagara Falls. In the final work it appears again as *Petalonema alatum* Grev. It had already been described from the same locality by Harvey (Nereis Boreali-Americana, III; 99-100, Pl. 48, A., 1858) The specimen distributed by Dr. Wolle is *Scyt. alatum* (Berk.) Borzi mixed with *Scyt. mirabile* (Dillw.) Bornet.

Tolypothrix rupestris Wolle, in the Bulletin of the Torrey Botanical Club (VI; 185, 1877), was described from specimens growing upon wet rocks at the Delaware Water Gap. It does not differ at all from *T. tenuis* Kuetz., except in habitat and perhaps slightly in habit. The microscopic characteristics are the same, as is shown by an authentic specimen sent by Mr. Wolle at the writer's request, a number of years ago.

Tolypothrix muscicola, announced as an addition to our flora by Wolle in 1877 (Bull. Torr. Bot. Club, VI; 139) and included also in the Fresh Water Algæ of the U. S. (p. 246, Pl. 81, fig. 1–4) was distributed by Wolle as No. 39 of the set of Algæ already mentioned several times. This specimen is not to be distinguished from *T. tenuis* Kuetz., while Kuetzing's *T. muscicola* is referred by Bornet and Flahault to *T. lanata* (Desv.) Wartmann.

Diplocolon Heppii Naeg., was found first in this country by Mr. Wolle, forming a blackish-brown gelatinous stratum upon rocks at Niagara Falls and was announced by him in the Bulletin of the Torrey Botanical Club for 1877 (VI; 139). The plant appears under the name of *Scytonema Heppii.* (Næg.) Wolle, in the Fresh Water Algæ of the U. S. (p. 260, Pl. 195, fig. 1–9 (very poor!). Dr. Bornet writes that since the publication of the "Revision," he has been able to examine larger suites of specimens and has, in consequence, come to the conclusion that *Diplocolon Heppii* Næg. and *Nostoc macrosporum* Menegh. are inseparable. But the form is still deserving of generic rank and the genus Diplocon is still to be distinguished from the genus Nostoc by its branched trichomes, a character not found in the tribe of the *Nostocaceæ*, but allying this form still with the tribe of the *Scytonemaceæ*. Zukal (Notarisia, V; 1106-1114, 1890, with plate) in a paper entitled "Ueber die Diploconbildung (ein Abart der Nostocmetamorphose)" came to a similar but less definite conclusion. Wolle's specimen, distributed under the title of "*Diplocolon Heppii?*" from Niagara Falls, represents for the most part a stage intermediate between the typical *Diplocolon Heppii* and the typical *Nostoc macrosporum*.

SHORT ARTICLES.

NOTES ON MONTEREY CONIFERS :—Observations on *Pinus insignis*, during the past four years, disclose the fact that a large proportion of new shoots produce two whorls or partial whorls of cones each year, many produce three, a lesser number four, and, rarely, specimens producing five whorls are found. Many shoots show evidence of having borne three series of whorls for three successive years, and occasionally an abortive series gives proof of more, or longer, series. The cones of the abortive series of whorls usually shrivel up, apparently unfertilized, at the beginning of their second year. Closed ripe cones are difficult to find by the time that the next crop ripens; in fact, exposed cones begin to open with the first warm spell after they become ripe, and, unless very well sheltered, the usual warm spells of the Indian Summer open the last of the crop. Occasionally new cones are forced out at the base of old branches, apparently through arrested development of terminal shoots. I found three yearling cones thus placed on the first day of May. May it not be that this phase, taken with that of the production of several series of whorls of cones, and the added fact that these cones require two years to perfect seed, account for an undeserved classification of *Pinus insignis* as a long-closed-cone species?

Pinus muricata occasionally, though rarely, produces three or four whorls of cones in a year, but as one may count from five to fifty whorls on a single stem, and not one cone open, the tree seems to deserve its place in the long-closed-cone group. The cones of this species often grow in crowded, double whorls, so close together that the bark cannot be seen between them. In such cases, the cones become embedded in the later growth of wood and practically girdle the tree which breaks off at that place with the first pressure.

On the bank of a sandstone ridge, in soil too poor to be occupied by the surrounding Adenostomas, Manzanitas, and chinquapins, I recently found a miniature forest of *Cupressus macrocarpa.* The trees, which numbered hundreds, were mature, bearing clusters of ripe fruit. They were rather crowded and strict in habit, and barely twelve inches high. As the trees were found just at evening and rain was falling, I was forced to leave extended observation to a future date, but poverty of soil would seem to be sufficient cause for the condition of the trees: — J. B. HICKMAN.

LEMNA GIBBA IN SOUTHERN CALIFORNIA: — This plant has either been overlooked by collectors in Southern California, or it is rapidly increasing. It seems to be now quite common in the coast counties of the region. It is abundant at Pasadena, at Compton, near San Pedro, in Santa Monica Cañon, and near San Juan. In a ditch at Compton I found it fruiting abundantly on September 2nd. — A. J. MCCLATCHIE.

NEW BOOKS.

The Bamboo-Garden, by A. B. FREEMAN-MITFORD, and *Round the Year*, by PROF. MIALL, both published by Macmillan, we hope to notice at greater length in a future issue.

REVIEWS AND CRITICISMS.

Eucalyptus. By ABBOT KINNEY. B. R. Baumgardt & Co., Los Angeles, Calif. 1895. 304 pp., 30 plates.

Mr. Kinney speaks of his book as a "Monograph on the Eucalyptus," and has attempted to make it a summary of scientific and commercial information on the genus. The book proves, however, to be mainly a compilation, and, unfortunately, one which could have been greatly improved by reference to any good botanical and technological library.

The botanical descriptions are mostly meagre, being nearly all copied verbatim from Mueller's summary of the leading characteristics, in Decade X of the Eucalyptographia, which descriptions were never intended to be used, alone, for the determination of species. Sandwiched among these are one or two copied from Bentham's Flora Australiensis. The only indication that they are not the author's own work, is a vague sentence in the "Foreword" at the beginning of the book. The short artificial keys under the four groups, and the plate illustrating typical anther-forms in the groups, were prepared by Prof. A. J. McClatchie, formerly connected with Throop Polytechnic. The only original pieces of work in the systematic portion, for which Mr. Kinney can claim credit, are, the sequence of species, which does not appear to offer any advantage over that of Mueller, and the detection and description of three so-called new species, and six "varieties." These last are called varieties of *Eucalyptus amygdalina* var. *regnans*, and, fortunately for the synonymy of the genus, have been numbered instead of named. Three of Bentham's varieties of *amygdalina* are enumerated, though without any indication that Mr. Kinney is not their sponsor. These are arranged in such a way that they appear as varieties of variety *regnans*, to which, however, no author's name is attached, so that we have the following strange combinations: "*Eucalyptus amygdalina regnans* var. *radiata*," "*E. a. r.* var. *nitida*" and "*E. a. r.* var. *Hypericifolia*."

The naming of three "new species" of an Australian genus, from young specimens grown in California, after barely three years study of but few specimens and a limited number of species, by a tyro in botany, in the face of the fact that type-specimens had been submitted to the late Baron von Mueller and had been referred by him to forms of already well-known species, confounds one by its audacity. The only excuse which we can offer to Australian botanists for such an occurrence in California is, that it shows Mr. Kinney to be unacquainted with either the science of botany or its etiquette. No trained botanist, even after years of experience, would attempt to monograph a genus with such slender material as Mr. Kinney has used, and the absurdity of the thing is made plainer by the fact that the genus in question is conceded, by all botanists, to be the most difficult in the whole of the vast Australasian Flora. No botanist would have named a tree from Australia as "*Eucalyptus Californica*," nor have given us a name with such an ungrammatical ending as "*Eucalyptus McClatchie.*" No botanist would have the conceit to set up his own opinion, derived from books and comparatively few specimens, these under cultivation (perhaps representing only extreme forms of a variable species), in a foreign country, against that of trained observers, living for years among the native haunts of those same plants, and familiar with the varying aspects of the same species under varying conditions of soil and climate, and familiar also with the intergrading forms of variable species.

Mr. Kinney's new species are, here, referred to the species to which they seem to belong. They are based mainly on differences in yield of oil.

Eucalyptus Californica, Kinney, Eucalyptus, p. 191,=a form of *E. occidentalis*. "It was the oil that caused me to set up as a species *Eucalyptus Californica* for what was before deemed a form of *E. occidentalis*." *Ibid.* p. 279. "What I have called *E. Californica* is by Von Mueller called *occidentalis*." *Ibid.* p. 177.

Eucalyptus Mortoniana, Kinney, *op. cit.* 193,=a form of *E. Globulus*. "Of the three species named by me the Baron thought one might be a form of *E. globulus*, and another he called *E. occidentalis*. A reference to the chapter on Eucalyptus oil will show that it would be justifiable to found new species on these trees from the oils alone." *Ibid.* p. 176. "Border of [calyx-]-tube has appearance of a pot of some thick fluid boiling over." *Ibid.* p. 193.

Eucalyptus McClatchie, Kinney, *op. cit.* 188=*E. goniocalyx,* probably. "General appearance of the tree suggests *E. globulus* or *E. goniocalyx.*" *Ibid.* p. 188.

Mr. Kinney supplies a glossary for the use of his nonbotanical readers. It is copied from Gray's "First Lessons in Botany," word for word, save that the references to figures and definitions in the text are omitted by Mr. Kinney. Sometimes the result is disastrous, for instance where we read "*Accessory:* something additional, as *accessory buds*", the person who would be the wiser for reading such a definition would surely not have any use for a glossary. Again, "*Anatropous* or *Anatropal* ovules and seeds": this is positively misleading, and makes it appear that anatropous is synonymous with ovules, and anatropal with seeds. Where Gray referred entirely to the text for a definition, Kinney has omitted the word altogether, evidently from lack of ability to give an original definition, or of knowledge of any other place in which to find one; a further proof that he is not a botanist. We fail to see, moreover, why the glossary of a book on *Eucalyptus* should be burdened with the definitions of such words as the following, picked at random: "*Acorn;* the nut of the Oak"—what have oaks to do with Eucalypts? Oaks do not even grow, wild, in Australia, at least not those oaks which bear acorns. Again, we find "*Amphigastrium*; a peculiar stipule-like leaf of certain Liverworts:" does Mr. Kinney mean that the Amphigastria-bearing Hepaticae grow on species of Eucalyptus? and if so, how did it happen that there is no account of them in his text? "*Caryopsis :* the one-seeded fruit or grain of Grasses, etc.," "*Strobile,*" and "*Tuber*" do not belong in the glossary of a monograph of Eucalyptus, unless, indeed, its author wishes to give a complete glossary of terms used in describing plants, to make his book more generally useful. But if this were the case, how is it that such terms as "*patellar,*" "*tetrahedrous,*" and "*dorsified*" [*dorsifixed?*], which are used in

Mr. Kinney's copied descriptions of Eucalyptus, find no place in his glossary? There is only one logical answer to these questions, viz.: that Mr. Kinney did not know what to put in and what to leave out; another proof that he is not a botanist. Lest Mr. Kinney should think he can shelve the blame for omissions, on Dr. Gray, we might remark that Dr. Gray was writing only for students of the native flora of the North-Eastern United States, in which the Order Myrtaceæ is entirely unrepresented. Though the whole thirty-six pages of the glossary are merely copied from another man's book, there is nothing stated to indicate that it is not Mr. Kinney's original composition; no reference to the work from which it was thus empirically taken. This is plain plagiarism.

Fifteen pages are transcribed from "Pharmacology of the Materia Medica." Part of the article on "The Chemistry of Eucalyptus" is word for word as given by Stillé and Maisch in the National Dispensatory under Oleum Eucalypti, save that Mr. Kinney has made several gross errors in copying the figures of formulæ and boiling points, which entirely destroy the utility of the article. On one page there are four such errors in six consecutive lines. Many other gross errors are noticeable, but we have said enough on this head. Where not copied, the subject matter is often irrelevant.

There is no mention of the importance of Eucalyptus bark and kino for tanning, although *E. amygdalina*, *E. calophylla*, *E. leucoxylon*, and other species, yield valuable tan-barks. The alleged relief obtained by smoking Eucalyptus leaves in cases of asthma, and the use of the leaves for keeping moths out of clothes, might also have been mentioned.

The twenty-nine half-tone reproductions of photographs, illustrating Californian specimens of Eucalyptus, are the best part of the whole compilation. It is very regrettable that the time, energy and money which Mr. Kinney expended over his book did not bring forth better results, as might have been the case. We really fail to see of what use the book will be to anyone. — J. BURTT DAVY.

MISCELLANEOUS NOTES AND NEWS.

It is expected that a monograph of Californian species of Chenopodiaceae will be published during the coming year by Mr. Willis L. Jepson, who has been devoting himself to the North American representatives of the order. Additional field notes and herbarium material will be welcomed, from all parts of Western America, for which an equivalent return will cheerfully be made.

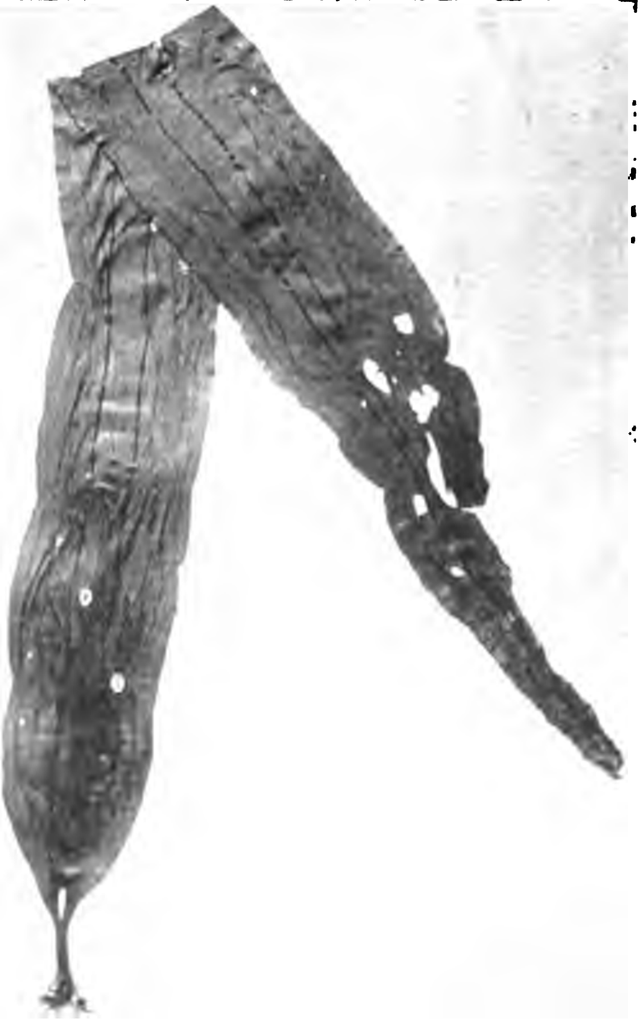
Woad, *Isatis tinctoria*, is still used in conjunction with indigo, to a small extent, by a few of the more conservative English dyers. A small industry in the preparation of woad extract lingers on among the Fens of East Anglia.

Mr. Jepson is expected to return to California about the middle of January.

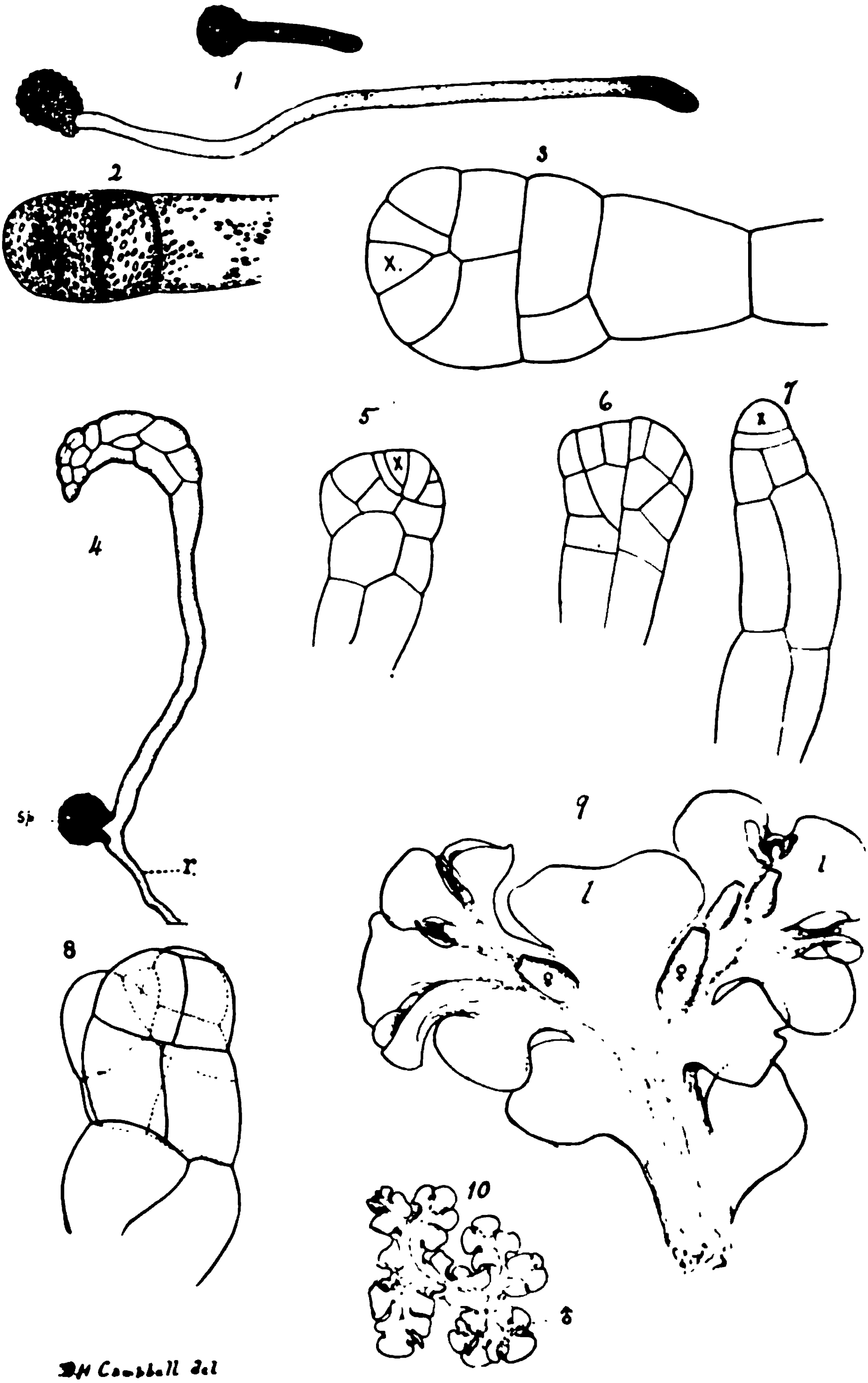
The January number of Erythea will probably not be issued until the 20th. of the month. Those who desire the journal for 1897 are asked to remit at once the subscription price, $1.50. to Willis L. Jepson, Berkeley, California, U. S. A.

ERRATA.

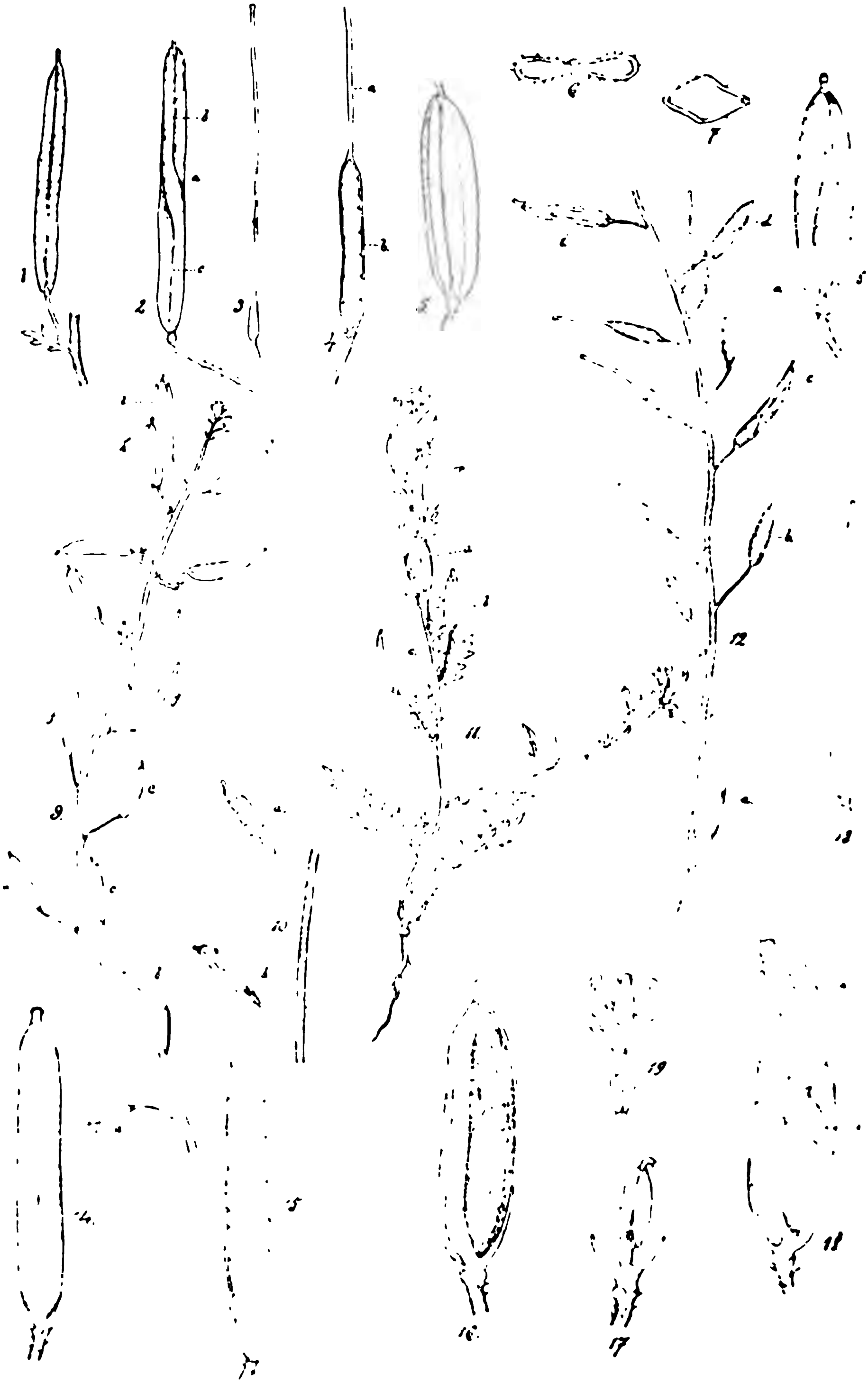
Page 17, line 35, for Bioletti read S. Biolettii.
" 32, " 14, " argenta read argentea.
" 62, " 8, " Ecologæ read Eclogæ.
" 62, " 14, " roslatum read rostratum.
" 62, " 23, " Rainer read Rainier.
" 62, " 33, " everal read several.
" 71, " 10, " extension read extensions.
" 71, " 11, " is read are.
" 81, " 12, " Triacanthi read triacanthi.
" 81, " 19, " smaller read larger.
" 83, " 4, " Negundo aceroides read Celtis occidentalis.
" 91, " 17, " for Ginko read Ginkgo.
" 120, " 32, " Cylindrosdermum read Cylindrospermum.
" 126, ' 29, " anthor read author.
" 126, " 6, " T. E. Areschoug read J. E. Areschoug.
" 127, " 12, " for has been flowered read has flowered.
" 146, " 19, " Centrall read Central.



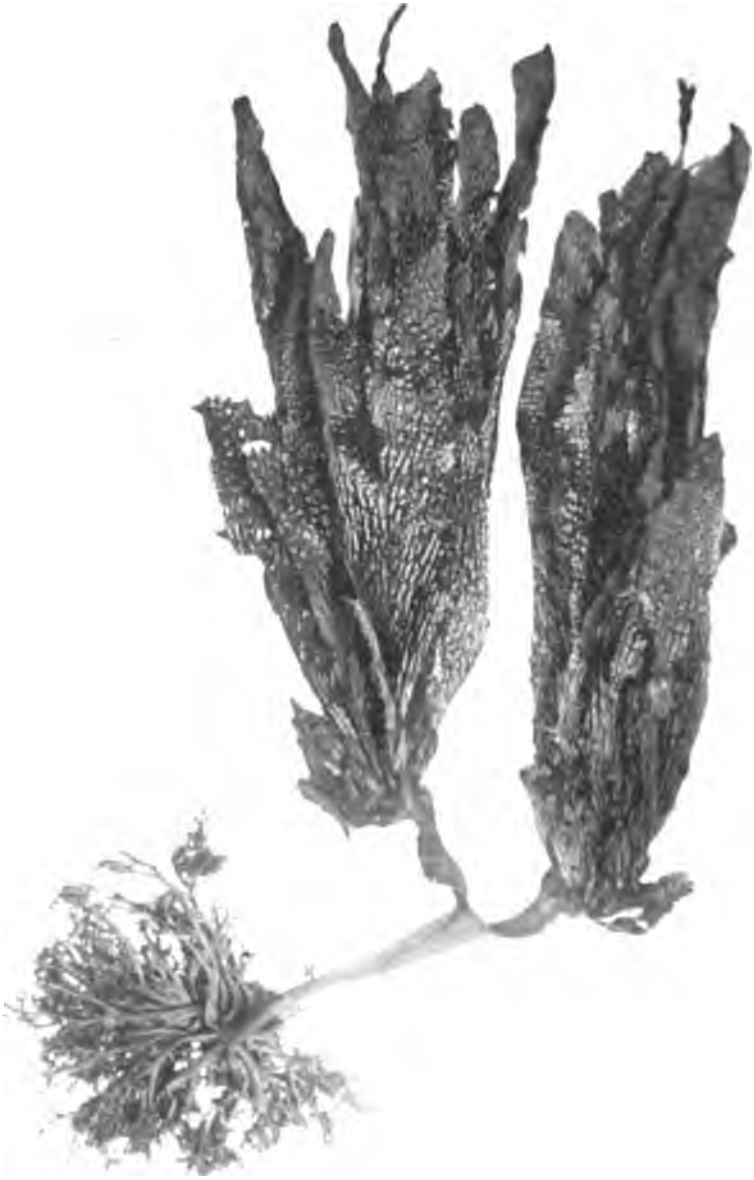
DICTYONEURON CALIFORNICUM, Rupr.



SPHAEROCARPUS TERRESTRIS, var. CALIFORNICUS.



ROBINSON ON TROPIDOCARPUM.



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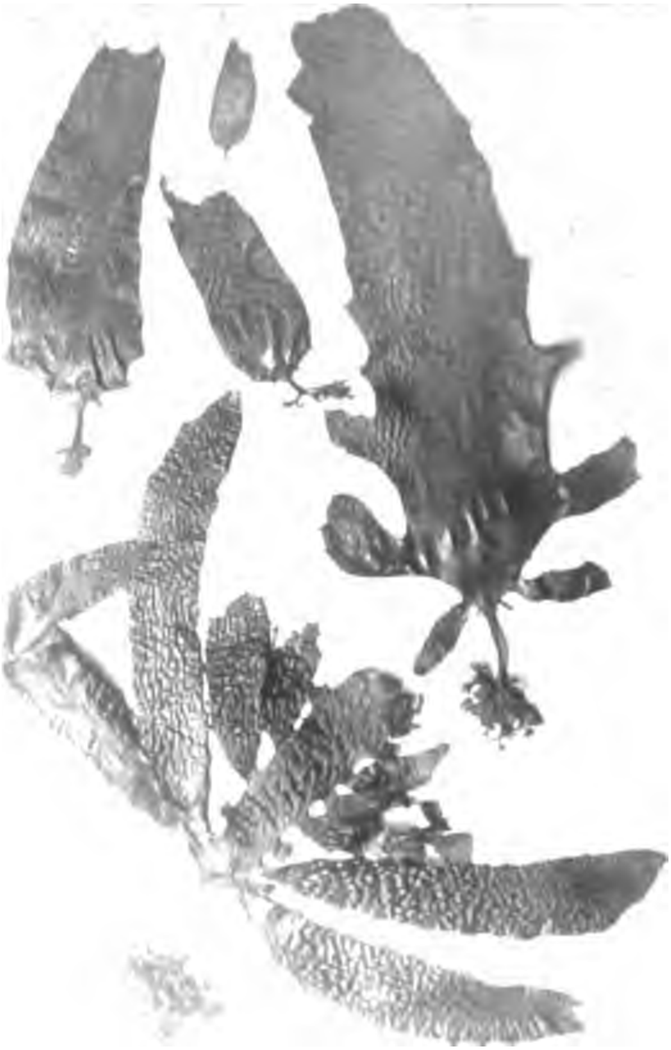

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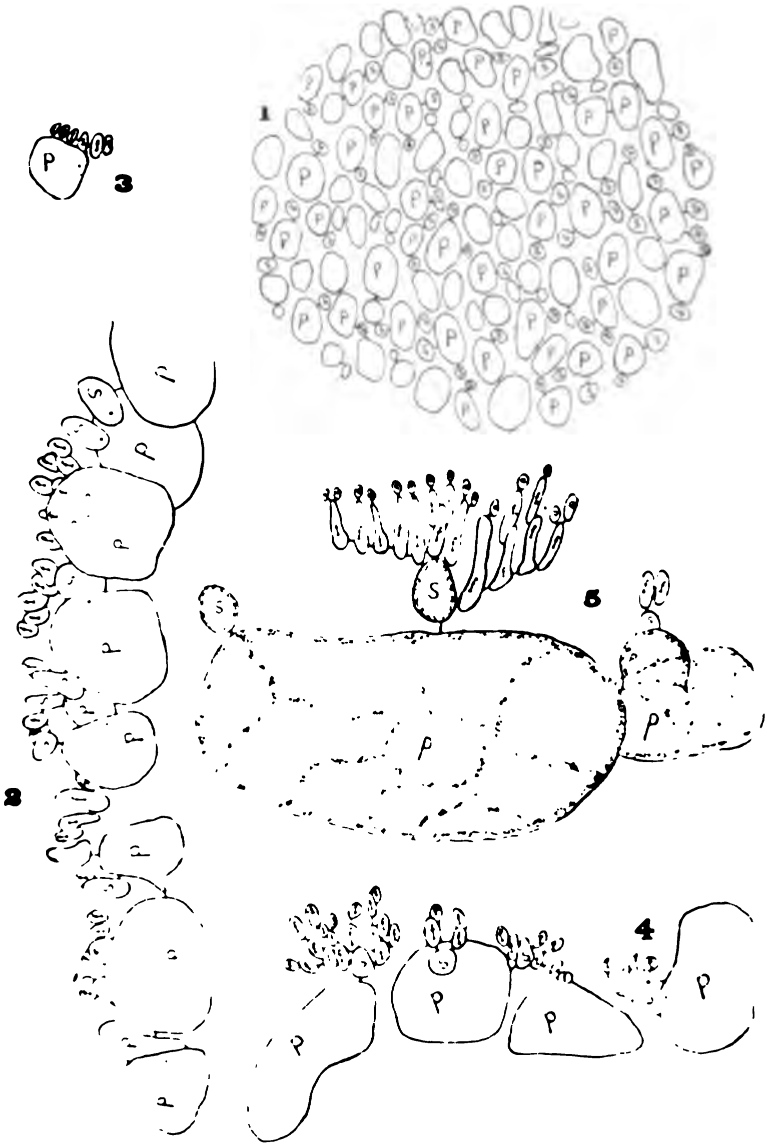
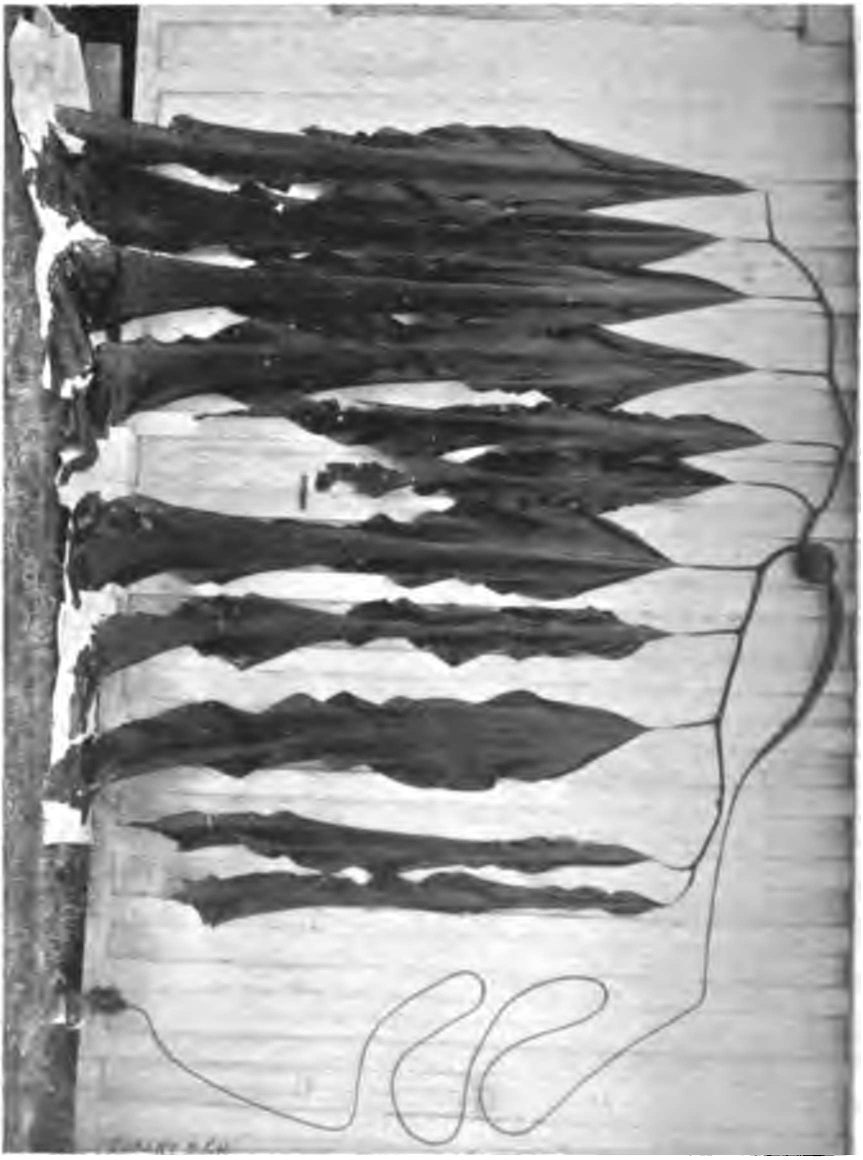


CHAMPIA PARVULA.



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